Five-Year Review Report

Third Five-Year Report

For

Apache Powder Superfund Site

Cochise County, Arizona

September 2012

Prepared by:

U.S. Environmental Protection Agency, Region 9
San Francisco, California

Approved by:

Date:

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9/20/12

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List of Acronyms

ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
ANPI	Apache Nitrogen Products, Inc.
APC	Apache Powder Company
ARARs	Applicable or Relevant and Appropriate Requirements
AWQS	Aquifer Water Quality Standard
BTEX	benzene, toluene, ethylbenzene, xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemicals of concern
DNT	dinitrotoluene
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
gpm	gallons per minute
H+A	Hargis + Associates, Inc.
LCU	laterally-confining unit
MCA	Molinos Creek sub-Aquifer
MCL	Maximum Contaminant Level
µ/L	micrograms per liter
mg/L	milligrams per liter
MNA	monitored natural attenuation
NARS	Northern Area Remediation System
NPL	National Priority List
O&M	operation and maintenance
ppb	parts per billion
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SAG	Southern Area Groundwater
SDWA	Safe Drinking Water Act
TNT	trinitrotoluene
UAO	Unilateral Administrative Order
VOC	volatile organic compound

Executive Summary

This is the third Five-Year Review of Apache Powder Superfund Site (the "Site") in Cochise County, Arizona. The purpose of this Five-Year Review is to review information to determine if the remedy is and will continue to be protective of human health and the environment. The triggering action for this Five-Year Review (FYR) was the signing of the previous FYR in September 2007.

The Apache Powder Superfund Site is located in Cochise County, approximately 7 miles southeast of Benson, Arizona. The Site itself comprises approximately 1,100 acres of land owned by Apache Nitrogen Products, Inc. (ANPI). ANPI has continued to manufacture ammonium nitrate and other chemical products for the mining and agricultural industries while the Superfund cleanup has been on-going. The San Pedro River flows along the eastern portion of the Site from the southeast corner of the ANPI property north towards the northwest. Discharges of process washdown waters to unlined ponds and washes caused groundwater to be contaminated with nitrate and perchlorate. Other disposal practices led to soils contamination with certain metals in various areas of the Site, including in some of the evaporation ponds.

In 1994, EPA selected the remedy for the Site to protect long-term human health and the environment. In 1997, EPA issued an Explanation of Significant Differences which divided the Site remedy for the shallow aquifer groundwater contamination into two areas: a Northern Area and a Southern Area. In 2000, EPA signed ESD #2 which established cleanup standards for metals that were not included in the 1994 ROD. In 2005, EPA signed a ROD Amendment which changed the remedy for the cleanup of Southern Area Groundwater from the use of constructed wetlands to monitored natural attenuation (MNA).

The remedy for the Site included capping of contaminated soils and sediments on site, Institutional Controls (ICs), monitored natural attenuation (MNA) of contaminated groundwater in the Southern Area of the Site, pump and treatment of contaminated groundwater in constructed wetlands, and MNA for the leading edge of the plume beyond the influence of the extraction well in the Northern Area of the Site.

According to the data reviewed, the site inspection, and the interviews, the groundwater remedy is functioning as intended by EPA's remedy decision documents in the Northern Area, but not as quickly as expected in the Southern Area due to a "concentration stratification" effect. ANPI has proposed in-situ treatment as a method for enhancing the MNA remedy in the Southern Area. However, because the perched zone and Molinos Creek Sub-Aquifer (MCA) are hydraulically isolated from the shallow aquifer associated with the San Pedro River and there are no drinking water wells within the Southern Area, the functioning of the Southern Area remedy is not impacting public health, only long-term monitoring costs. There have been no changes in the Applicable or Relevant and Appropriate Requirements (ARARs) that would affect the protectiveness of the remedy. The assumptions used in determining exposure pathways are considered to be health protective and reasonable in evaluating risk for this site. There have been no changes in the toxicity factors or other contaminant characteristics that could affect the

protectiveness of the remedy and there has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

The remedy at the Apache Powder Superfund Site is protective of human health and the environment for both groundwater and soils because there is no current exposure. The ICs restricting access to the contaminated shallow aquifer for drinking water purposes and restricting access to pond soils on-site where residual contamination has been capped were put in place in 2008.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Apache Powder Superfund Site		
EPA ID: AZD008399263		
Region: IX	**State:** AZ.	**City/County:** St. David / Cochise County

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** Yes Brine Concentrator, December 1994; NARS, November 1997; Soils Media Components, September 2008; PCOR, September 2008

REVIEW STATUS
Lead agency: EPA. **If "Other Federal Agency" was selected above, enter Agency name:**
Author name (Federal or State Project Manager): Andria Benner
Author affiliation: EPA
Review period: 02/01/2012 to 09/15/2012
Date of site inspection: 06/12/2012
Type of review: Statutory
Review number: 3
Triggering action date: September 2007.
Due date *(five years after triggering action date)*: September 2012

Issues/Recommendations

Issues/Recommendations Identified in the Five-Year Review:

There are no issues that affect protectiveness. All required Land Use Restrictions and other ICs are now fully in place. All issues and follow-up actions identified in the 2007 Second FYR Report have been addressed or new data have precluded the need for those follow-up actions.

Sitewide Protectiveness Statement (if applicable)

The remedy at the Apache Powder Superfund Site is protective of human health and the environment for both groundwater and soils because there is no current exposure. The ICs restricting access to the contaminated shallow aquifer for drinking water purposes and restricting access to pond soils on-site where residual contamination has been capped were put in place in 2008.

1.0 Introduction

The purpose of a Five Year Review (FYR) is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of these reviews are documented in FYR Reports. In addition, FYR Reports identify issues found during the review, if any, and recommendations to address them. This is the third FYR for the Apache Powder Superfund Site. The first FYR was completed in September 2002, and the second FYR was completed in September 2007.

The Agency is preparing this Five-Year Review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section 104 or 106, the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The agency interpreted this requirement further in the NCP. 40 CFR §300.430(f)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

EPA Region 9 in coordination with the Arizona Department of Environmental Quality (ADEQ) has conducted this FYR of the remedial actions implemented at the Apache Powder Superfund Site, located seven miles south of the city of Benson, in Cochise County, Arizona. The entire Site comprises one Operable Unit (OU). This review has been completed because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unrestricted use and unlimited exposure. The triggering action for this review was the prior five year review completed in September 2007. This review was conducted from April 2012 through September 2012. This report documents the results of the review.

2.0 Site Chronology

Table 2-1 provides a chronology of events at the Site

Table 2-1: Chronology of Site Events

Event	Date
Apache Powder Company (APC) began manufacturing industrial chemicals and explosives at the Site	1922
APC discharged facility wastewater to dry washes that discharged into San Pedro River	1922 to 1971
Dye Carbonics operated a carbon dioxide plant at the Site	1973 to 1979
APC discharged facility wastewater into unlined evaporation ponds	1971 to 1995
Arizona Department of Health Services (ADHS) identified the Site as a potential problem	1979
EPA proposed listing of Site on National Priority List (NPL)	1986
Preliminary investigation performed; San Pedro River hot-spot identified	1987
EPA issued a special Notice Letter to APC notifying it of its liability and offering the opportunity to conduct a Remedial Investigation/ Feasibility Study (RI/FS)	1988
EPA issued a Unilateral Administrative Order (UAO) for Remedial Investigation/Feasibility Study	1989
ANP supplied bottled water supplied to residents with nitrate-contaminated wells	1989
EPA listed Site on NPL	1990
APC changed name and became Apache Nitrogen Products, Inc. (ANPI)	April 1990
EPA assumed federal lead from State for Site cleanup	1993
EPA directed ANP to remove approximately 262 drums containing dinitrotoluene (DNT) and approximately 60 cubic yards of DNT–contaminated soils from Wash 3, where they were stored in a temporary on-site storage area (TOSA)	1993
ANPI completed draft Remedial Investigation/ Feasibility Study Report	1994
EPA assumed federal lead from ANPI to complete FS	June 1994
ADEQ and ANPI signed State Consent Decree (CD) to bring ANPI into compliance with state air regulations, Resource Conservation and Recovery Act (RCRA) hazardous waste requirements, and aquifer protection permit (APP) requirements	June 1994
EPA signed Record of Decision (ROD)	September 1994
ANPI constructed eight deep aquifer replacement wells for households using bottled water	October 1994
State of Arizona signed Consent Decree with ANPI for cleanup of active hazardous waste and aquifer protection cleanup activities	November 1994
EPA issued Unilateral Administrative Order (UAO) for cleanup of groundwater and soils under CERCLA	December 1994
ANPI completed construction of brine concentrator	December 1994

Table 2-1: Chronology of Site Events

Event	Date
Full scale start-up of brine concentrator to treat wastewater; wastewater no longer discharged to unlined ponds	April 1995
EPA signed Explanation of Significant Differences (ESD) #1 to allow treatment of the perched aquifer with the southern shallow aquifer in a southern area wetlands, additional well installation, and soil characterization, treatment and removal	April 1997
ANPI constructed the Northern Area Remediation System (NARS) for treatment of nitrate contaminated groundwater in Northern Area	1997
State CD closed Open Burn/Open Destruction (OBOD) Area	March 1997
ANPI discovered a TNT-Contaminated Area	August 1997
ANPI detected perchlorate in perched and shallow aquifer groundwater and shallow soils; perchlorate investigation completed	November 1998
NARS in vegetation establishment and early start-up phase	1998 to 2003
ANPI completed an Unexploded Ordnance (UXO) Survey of TNT-Contaminated Area	February 1999
EPA signed a Time-critical Removal Action Memorandum for removal of TNT-contaminated soils under the UAO sections for 'Other Response Actions' and 'Endangerment and Emergency Response'	November 1999
ANPI conducted TNT pre-burn of highly explosive materials	December 1999
ANPI cleaned up Media Components 4 (White Waste Materials and Drum Storage Area), 5 (Wash 3 Area), and 7 (Drums located outside Wash 3 Area); contaminated soils were removed from these areas and the TNT-Contaminated Area	January 2000 to June 2000
ANPI completed a Removal Action Implementation Report issued for TNT-contaminated Area and Remedial Implementation Report for Media Components 4, 5, and 7	August 2000
EPA signed ESD #2 to establish clean up standards for chemicals of concern (COC) in soils recently detected or not mandated in the ROD; it also modified soil cleanup remedies to 'No Further Action' where concentrations were non-hazardous or less than State of Arizona SRLs (EPA clean-up standards)	September 2000
ANPI completed Remediation Implementation (RA) Report for Media Component 3 (Inactive Ponds 4A, 4B, 5A, 5B, 6A, 6B, 7, 8, and Dynagel Pond)	February 2001
ANPI conducted San Pedro River water quality follow-up sampling	October 2001
ANPI commenced NARS start-up testing for the season	June 2002
EPA conducted follow-up San Pedro water quality sampling	July 2002
ANPI conducted an investigation to further characterize the lateral confining unit (LCU) in the Southern Area shallow aquifer and the source of the nitrate hot-spot in the San Pedro River in the Northern Area	September 2002
EPA completed first Five-Year Review Report	September 2002
EPA approved NARS discharge treatability study plan	November 2002
ANPI completed Characterization of Groundwater Systems in Southern Area Report	June 2003
ANPI completed Applicability of Monitored Natural Attenuation (MNA) Report	July 2003

Table 2-1: Chronology of Site Events

Event	Date
ANPI completed Supplemental Feasibility Study for Media Component 2B (Southern Area Groundwater)	August 2003
ANPI completed Summary of Soil Analytical Data Report	February 2004
ADEQ completed risk assessment evaluations for selected inactive and formerly active ponds on the Site no longer in use with residual concentrations of certain metals (arsenic and beryllium)	August 2004
ANPI completed Screening Level Ecological Risk Assessment (SLERA)	November 2004
ANPI completed Supplemental Feasibility Study Report for Pond Soils and Sediments	April 2005
ANPI completed a Northern Area Groundwater Model	July 2005
ANPI commenced full-scale treatment of nitrate in NARS	July 2005
EPA signed ROD Amendment to change remedy to monitored natural attenuation of the nitrate and perchlorate-contaminated groundwater in the Southern Area and containment of the contaminated soils in some on-site ponds with a native soil cap	September 2005
ANPI completed RD/RA Work Plan for Pond Soils and Sediments (CERCLA Media Components 3 and Formerly Active Ponds)	February 2006
ANPI completed Comprehensive Northern Area Characterization Workplan to determine extent of nitrate in Northern Area	August 2006
ANPI completed Southern Area Workplan to install groundwater monitoring network for MNA remedy	September 2006
ANPI completed Southern Area Characterization Report	March 2007
ANPI completed re-grading and capping of ponds with residual soils contamination above soil remedial levels (SRLs)	August 2007
ANPI completed Southern Area Performance Monitoring Plan	September 2007
EPA completed second Five-Year Review Report	September 2007
ANPI completed updated Community Outreach Plan	September 2007
EPA completed Site Inspection Report – Remedial Action Complete	January 2008
ANPI completed RA Implementation Report for Pond Soils and Sediments	April 2008
ANPI completed Soils Engineering Control Plan	April 2008
ANPI completed Northern Area Monitored Natural Attenuation (MNA) Assessment	July 2008
ANPI completed Long-Term Site-Wide Remedies Performance Monitoring and O&M Plan	July 2008
EPA signed ESD #3 modifying remedy to allow MNA for the contaminated groundwater in the Northern Area at the leading edge of the plume outside the capture zone	July 2008
ANPI signed a Declaration of Environmental Use Restriction (DEUR) with ADEQ for the pond soils and the contaminated groundwater underlying the Site	August 2008
EPA completed Final RA Report for Soils	September 2008

Table 2-1: Chronology of Site Events

Event	Date
EPA completed Interim RA Report for Northern Area Groundwater	September 2008
EPA completed Interim RA Report for Southern Area Groundwater	September 2008
EPA completed Preliminary Close-Out Report (PCOR) for Remedies	September 2008
ANPI completed Northern Area Performance Monitoring Plan for MNA of Shallow Aquifer Groundwater in the Northern Area	February 2009
ANPI completed updated Alternate Domestic Water Supply Plan	February 2009
EPA signed Consent Decree (CD) with ANP for remaining work, past and future costs	September 2009
EPA determined Site had Ready for Reuse Status	September 2009
ANPI completed and EPA approved an updated Quality Assurance Project Plan (QAPP)	July 2010
ANPI reported the discovery of sulfur in buried rail cars requiring removal from soils	November 2011
ANPI announced its intention to clean up any "legacy" contamination problems, as part of demolishing historical structures no longer in use	March 2012
EPA's contractor conducts FYR Site Inspection	June 2012
ANPI provided EPA written notification of its multi-year, multi-phase plan to upgrade the manufacturing facility on the Site.	June 2012

3.0 Site Background

The Apache Powder Superfund Site included a study area of approximately 9 square miles located in Cochise County, approximately 7 miles southeast of Benson, Arizona. See Figure 1, Map Showing Site Location. The ANPI property comprises approximately 1,100 acres of land within this study area. The San Pedro River flows along the eastern portion of the Site from the southeast corner of the ANPI property north towards the northwest. This river is a significant riparian region. See Figure 2, Map of Study Area.

Major land uses within the vicinity of the industrial site include low-density residential and agricultural use. The primary undeveloped landscape consists of high desert chaparral, mesquite bosques, and riparian cottonwood stands that line the primary drainages including the San Pedro River.

Land and Resource Use

An estimated 150-200 people live in the study area. There are privately owned residences located north of the Site, with the nearest residence less than a quarter mile from the ANPI facility. Approximately 1,100 people depend on wells for drinking water within three miles of the Site study area. There is the potential for future expansion and growth in the St. David/

Benson community. However, with the recent economic downturn beginning in 2008, the growth in the regional area surrounding the ANPI facility is relatively slow.

In late 2011, ANPI announced that it was interested in upgrading the existing operations facility and removing any "legacy" contamination problems. The company has developed and submitted initial plans to EPA and ADEQ for demolishing an estimated 160 historical industrial buildings or structures on the Site. ANPI has hired several contractors to support this effort and has identified lead-based paint and asbestos as possible contamination problems in some of these industrial buildings. The demolition activities are planned in seven phases over several years. As of September 2012, ANPI had commenced Phase IA of these demolition activities.

Hydrology

The Site is located in the Upper San Pedro River Basin, which is situated within the Basin and Range physiographic province. The Basin and Range province is typified by broad, gently sloping alluvial basins separated by north-northwest trending crystalline fault block mountains. The basins were created by the subsidence of structural grabens along high-angle normal faults. Due to the closed drainage environment during subsidence, sediments deposited gradationally, with the coarse-grained sediments near the mountains and fine-grained sediments near the basin centers. The thickness of the alluvial sediments in the Basin (the St. David Formation) is unknown, but is thought to be greater than 1,000 feet near the center of the basin, thinning to a veneer along the mountain fronts. The St. David Formation in the Basin is one such extensive fine-grained unit, producing confined conditions in the center of the Basin surrounding the Site (H+A, 2007a).

The dominant surface water drainage feature in the Basin is the San Pedro River. Its overall watershed is approximately 2,500 square miles, including 700 square miles in Mexico. As the fluvial dynamics of the region changed from an erosional to a depositional environment, the surface water flow patterns were controlled by the paleo-channels. This resulted in the deposition of coarse-grained sediments in the paleochannels and fine-grained sediments between the paleochannels through lateral and vertical accretion (H+A, 2007a).

At the Site, the underlying St. David Formation is found underneath the operations area of the facility. The upper section of this Formation in the vicinity of the Site is comprised of a dense, low permeability clay that extends to depths of at least 300 feet below ground surface (bgs). It is this geology that facilitated infiltration of the washdown water discharges from the plant operations through unlined ponds and the formation of a "perched" groundwater system on top of the clay in the Southern Area of the Site. Water within the "perched" zone that had accumulated underneath the evaporation ponds eventually migrated across the St. David clay surface eastward into an adjacent paleo-channel named the Molinos Creek Sub-Aquifer (MCA), which was discovered in the early 2000s. As part of that same investigation, the MCA was determined to be hydraulically separated from the alluvial groundwater basin of the San Pedro River to the east of the MCA. Because the St. David clay surface occurs at elevations higher than water level in the shallow alluvial aquifer, the shallow aquifer is not present beneath the operations area of the ANPI facility. The groundwater used for manufacturing operations at the

facility is obtained by deep aquifer production wells drilled down at least 300 feet into a deep confined aquifer within the St. David Formation. See Figure 3, Conceptualized Hydrogeologic Cross-Section Through the Southern Area.

The deep aquifer is the source of drinking water for all the private domestic drinking water wells located on property over the contaminated shallow aquifer or within a conservative buffer zone. The Arizona Department of Water Resources coordinates closely with Arizona Department of Environmental Quality and EPA to make sure that all new drinking water supply wells in the vicinity of the contaminated plume are installed in the deep aquifer with adequate construction methods to prevent any potential cross-contamination between the two aquifers.

History of Contamination

Apache Powder Company (APC), now known as Apache Nitrogen Products, Inc. or ANPI, commenced operations in 1922. Explosives were manufactured at the ANPI facility and wastewater was discharged to unlined ponds and tributary washes. ANPI disposal activities are the source of the groundwater contamination in the shallow aquifer underneath the ANPI property in the Southern Area, in the Northern Area adjacent to and immediately downgradient of the ANPI property, and in the San Pedro River. Beginning in the early 1990s, ANPI installed a groundwater monitoring network for the shallow aquifer to determine the extent of contamination in both the Northern and Southern Areas of the Site. No contamination has been found in the deep aquifer lying beneath a thick aquitard under the shallow aquifer. In 1998, perchlorate was discovered in the groundwater in the Southern Area in the perched zone and in the adjacent Molinos Creek Sub-Aquifer (MCA). Additional details of the history of operation and disposal operations are included in the 2002 FYR Report, and in the USACE Analysis attached to the 2007 FYR Report.

Initial Response

In response to the 1987 discovery of nitrate-contamination in the shallow aquifer underneath and adjacent to the Site, ANPI provided bottled water to eight households whose drinking water supply wells were removed from service in 1989. ANPI replaced these eight contaminated wells with deep aquifer wells in 1994.

In 1990, ANPI was placed on the NPL. In June 1992, EPA and ADEQ agreed to split each agency's respective roles to ensure that the clean-up activities performed by ANPI were comprehensive and duplicative requirements were not imposed by the agencies. ADEQ assumed responsibility for ANPI's compliance with State requirements for aquifer protection, air quality, and hazardous waste management under RCRA. EPA, in turn, assumed responsibility for overseeing ANPI's cleanup of historical contamination at the Site under CERCLA (Superfund).

During the 1990s, investigations were conducted of various areas with soils contamination at the Site. Initially, three areas of soils contamination were identified and several other areas were later discovered. In 1999-2000, most areas with soils contamination were cleaned up. Contaminated soils located in drums or in surface soils were excavated and removed for

treatment and disposal. The soils in one area contaminated with TNT were pretreated on site (by burning) and subsequently shipped off-site for final disposal.

Basis for Taking Action

Hazardous substances and pollutants or contaminants released at the Site by media component include:

- Perched Groundwater: Arsenic, Fluoride, Nitrate and Perchlorate
- Shallow Aquifer Groundwater: Nitrate and Perchlorate in Southern Area; Nitrate only in Northern Area
- San Pedro River Surface Water: Nitrate only
- Inactive Pond Soils: Antimony, Arsenic, Barium, Beryllium, Chromium, Lead, Manganese, and Nitrate
- White Waste Area: Nitrate and Arsenic
- Drum Storage Area: Vanadium Pentoxide, Cooling Tower Ceramic Packing Material (later determined non-hazardous)
- Wash 3 Area (excluding Open Burn Open Dump (OBOD) Area: 2,4-Dinitrotoluene (DNT), 2,6 DNT, Lead and Paraffins (present as a result of DNT decomposition; later determined non-hazardous)
- Stained Soil Areas: DNT, Paraffins (later determined non-hazardous)
- DNT Drums Located Outside of Wash 3 Area: 2,4-DNT, 2,6-DNT
- Trinitrotoluene (TNT)-Contaminated Area: TNT, 2,4-DNT, 2,6-DNT, and 1,3,5-Trinitrobenzene

4.0 Remedial Actions

Media Components

The September 1994 Record of Decision (ROD) for the Site originally identified five media components:

- Media Component 1: Perched Groundwater Aquifer
- Media Component 2: Shallow Groundwater Aquifer
- Media Component 3: Inactive Ponds
- Media Component 4: White Waste and Drum Storage Area
- Media Component 5: Wash 3 Area (Excluding the Open Burn/Open Detonation Area)

Media Component 6 is not discussed because it does not identify a specific area of concern, but instead required additional investigative groundwater studies.

Subsequently, the following additional areas of concern were discovered at the Site:

- Media Component 7: Other Drums located outside of Wash 3 Area
- Removal Action: Tri-nitrotoluene (TNT) Contaminated Area

Additionally, as a result of additional investigations, the Media Component 2 (Shallow Aquifer Groundwater) was further divided into two new categories:

- ***Northern Area Groundwater*** (Media Component 2A comprised of two sub-components, the shallow aquifer groundwater within the capture zone of the extraction well, and the groundwater to the far north beyond the radius of influence of the extraction well).

- ***Southern Area Groundwater*** (Media Component 2B comprised of three sub-components, the Perched Zone, the Molinos Creek Sub-Aquifer and the Southern Area shallow aquifer groundwater near the San Pedro River).

- For clarity, the next FYR in 2017 should evaluate the two remaining areas of groundwater contamination, the Northern Area and the Southern Areas, as distinct areas rather than referring back to the original 1994 Media Components for groundwater. Over the intervening years, based on new data and various remedy changes, the terms used to discuss the groundwater cleanup areas has evolved into these two categories.

This 2012 FYR will evaluate in detail media components 1 and 2A and 2B related to groundwater contamination, and media component 3 (inactive ponds) because wastes were left in place and ICs were required for the capped ponds.

Media Components 4, 5, and 7, and the Removal Action were completed and closed out prior to or at the time of the 2007 FYR Report and documented in the 2007 Final RA Report for Soils. These media components are not re-evaluated in this 2012 FYR Report.

Remedy Decision Documents

The 1994 ROD required implementation of following remedial actions:

- Use of a brine concentrator to treat plant process wastewater for total dissolved solids, including nitrate, fluoride, and arsenic.
- Extraction of nitrate contaminated shallow ground water and the construction of a wetlands system (using biological treatment) to treat the water.
- On-site containment (capping) of contaminated soils in the "Inactive Ponds."
- Excavation and off-site treatment and disposal of contaminated soils (arsenic and dinitrotoluene [DNT]) from the White Waste Material and Drum Storage Area.
- Excavation and off-site treatment and disposal of the lead- and DNT- contaminated soils from the Wash 3 Area.

In 1997, EPA signed Explanation of Significant Difference (ESD) #1 which divided the Site remedy for the shallow aquifer groundwater contamination into two areas: a Northern Area and a Southern Area. This ESD allowed treatment of the shallow aquifer in separate areas and allowed for other design modifications to the wetlands system.

In 2000, EPA signed ESD #2 which established cleanup standards for metals that were not included in the 1994 ROD. This second ESD allowed "No Further Action" for soils media components where hazardous substances were not detected or where levels of contaminants did not exceed cleanup standards. ESD #2 also established an additional Media Component #7 - Other Drums - because of the discovery of additional drums outside of Wash 3.

In 2005, EPA signed a ROD Amendment which changed the remedy for the cleanup of Southern Area Groundwater from the use of constructed wetlands to monitored natural attenuation (MNA). The ROD Amendment also established a cleanup standard for perchlorate of 14 ppb. The Amendment also specified the institutional controls (ICs) needed for the Site to prevent use of the contaminated shallow aquifer groundwater underneath the ANP facility and clarified that future use would be non-residential.

The Remedial Action Objectives for the remedy described in the ROD Amendment are as follows:

- Restore the aquifer to drinking water standards for nitrate and EPA's site-specific cleanup level for perchlorate within a reasonable time frame;
- Minimize future migration of groundwater contamination;
- Restrict future use of the Site to non-residential uses;
- Reduce or eliminate further contamination of groundwater and surface water to allow the beneficial reuse of these resources; and
- Reduce or eliminate the direct contact threat associated with contaminated soil.

Remedy Implementation

Alternate Water Supply

In 1994, at EPA's direction, ANPI prepared an Alternate Domestic Water Supply Plan and replaced eight nitrate-contaminated shallow aquifer drinking water wells in the Northern Area with deep aquifer wells. The Alternate Water Supply Plan was updated again in 2007, and again in 2009. In 2007, ANPI provided bottled water to two shallow aquifer well owners who retained connections to the shallow aquifer wells for agricultural purposes only (the water was not being used for drinking water purposes). By 2012, only one household with a shallow aquifer well in the Northern Area is still provided bottled water because of nitrate levels exceeding the drinking water standard of 10 ppm (10 mg/L). There are no households in the Southern Area that use the shallow aquifer for drinking water purposes.

Media Component 1: Perched Groundwater Zone (part of Southern Area)

In April 1995, ANPI ceased discharge of process wastewaters to the evaporation ponds. As a result, the perched zone has dewatered significantly in the intervening years. The ROD required the perched zone to be treated by the brine concentrator; however, in the intervening year's EPA has allowed the perched zone to be actively dewatered by ANPI by pumping and then passive evaporation in open storage vessels. ANPI periodically disposes of the residual salts from this

evaporation process at an EPA-approved landfill. As of 2012, the perched zone is now dry with the exception of two monitoring piezometers.

Media Component 2: Shallow Aquifer Groundwater - later subdivided into Northern Area (2A) and Southern Area (2B)

In 1997, ANPI constructed the wetlands in the Northern Area and started extracting the shallow aquifer groundwater to be treated. After the 1998 discovery of perchlorate in the perched zone and the adjacent MCA in the Southern Area, the ROD was amended in 2005. This amendment changed the remedy for the cleanup of Southern Area Groundwater (contaminated with nitrate and perchlorate) from pump and treat with constructed wetlands treatment to monitored natural attenuation (MNA) and continued use of institutional controls.

Northern Area Shallow Aquifer Remedy (2A)

The shallow extraction well #1 (SEW-1) and wetlands treatment system known as the Northern Area Remediation System (NARS) was constructed in 1997 to remediate nitrate-contaminated shallow aquifer groundwater in the Northern Area. The establishment phase was originally estimated at 2 years. However, due to a number of unforeseen events, the first establishment phase included the time period from September 1997 through June 2001. There was a limited-scale start-up from June 2001 to November 2001 that ended when the wetland vegetation (cat tails) entered winter dormancy. Start-up testing was conducted in phases in which the extraction well was used to pump contaminated groundwater into the treatment cells of the wetlands to evaluate the necessary residency time needed to treat the nitrate, prior to full-scale operation. Additional start-up phases were performed in 2002, 2003, and 2004, with limited operational phases in the fall of each year.

In May 2005, sufficient data had been compiled indicating that the NARS was reliably treating nitrate down to the nitrate cleanup standard and full-scale startup and operation began in June 2005. As of 2012, the average effluent discharge has been below 2 ppm nitrate more than 95% of the time. The discharge limit is 10 ppm nitrate, the state and federal maximum contaminant limit (MCL) for nitrate. During the five year period there have only been two occasions during unusually cold weather spells in which the alternate secondary discharge location needed to be used for short periods (less than one week). As part of the operations and maintenance, if there is any concern that the wetlands effluent may be above the MCL, ANPI must use the alternate discharge point located at the wetlands to ensure no contaminated groundwater reaches the shallow aquifer. Since the last FYR period, the NARS wetlands system has been operating 24/7, 365 days per year, with no shut-down periods, except for the two cold weather incidents previously discussed.

Southern Area Shallow Aquifer Remedy (2B)

During this Five Year Review period, ANPI has been monitoring the Southern Area Groundwater to evaluate the effectiveness of monitored natural attenuation (MNA), the selected remedy as required by the 2005 ROD Amendment. Monitoring is the major implementation

activity underway for the MNA remedy in the Molinos Creek Sub-Aquifer (MCA) of the Southern Area. In 2006 and early 2007, ANPI conducted various field activities to further characterize the Southern Area, in particular the MCA, to design and locate wells for the MNA monitoring network. In 2007 , the results indicated that water levels and nitrate and perchlorate concentrations were continuing to drop in the MCA (although as of 2012, contaminant concentrations are now increasing while water levels continue to decline); and the lateral boundaries of the MCA were much smaller than originally thought. These findings confirmed the hydraulic isolation of the MCA groundwater from the shallow aquifer associated with the San Pedro River. These findings also indicated that in addition to the perched zone, the MCA was created "artificially" by the discharge of ANPI's plant washdown waters to washes and the unlined evaporation ponds, which ultimately migrated laterally from the perched zone into the MCA. However, because of these confined and contained (hydraulically stagnant) conditions, the concentrations of contamination in the MCA are not declining at the rate originally projected, as discussed in Chapter 6.0 of this Review.

Media Component 3: Inactive Ponds

Media Component 3 included nine unlined ponds at the ANPI Site that were classified as "inactive" (Ponds 4A, 4B, 5A, 5B, 6A, 7, 8, and the Dynagel Pond). Only the Dynagel Pond and Pond 7 were originally under EPA oversight. The Formerly Active Ponds 4A, 4B, 5A, 5B, 6A, and 8, were originally under the State Consent Decree.

During 2007-2008, the final remedial action work on the inactive ponds, including Pond 7 and the Dynagel Pond, was completed. As required by the 1994 ROD and the subsequent ESD #2, the ponds were capped with native materials and institutional controls (in the form of a Declaration of Environmental Use Restriction or DEUR) was put in place in August 2008 by ANPI to prevent any potential exposure to the buried contamination.

Media Components 4, 5, 7, and TNT-Contaminated Area

The remedies for Media Component 4 – White Waste and Drum Storage Area; Media Component 5, Media Component 7, and the TNT-Contaminated Area, which involved sampling, excavation and off-site disposal, were all completed before or within the time period of the first FYR. No further action or operation and maintenance were required for any of the actions once completed.

Operation and Maintenance

Alternative Water Supply

At the time of the 2005 ROD Amendment, a nearby private property owner raised concerns that the deep aquifer replacement wells could be causing potential loss of capacity in other deep aquifer wells under artesian pressure due to poor construction. As a result of this concern, in 2007, EPA directed its contractor, CH2M Hill, to evaluate the construction methodology of all the replacement wells. The results of this study indicated that all the replacement wells were

constructed properly and to an engineering standard of higher quality than that required by the State agencies. All wells were determined to be of good quality and functioning as designed. No O&M issues were identified.

Media Component 1: Perched Groundwater Zone

The O&M for Media Component 1 consists of maintaining the perched groundwater zone evaporation treatment system and maintaining the few remaining wells and piezometers with water in the perched zone for the purposes of groundwater monitoring. The pumps and wells for both the evaporation extraction system and the perched zone monitoring network require periodic maintenance. The residual salts from the nitrate and perchlorate-contaminated perched zone groundwater need to be periodically removed from the bottom of the above-ground storage tanks and disposed of in an EPA-approved landfill. Costs for monitoring over the FYR time period are included in the costs in Table 4-2. The maintenance costs for the pump, which is maintained by ANPI, are minimal. Maintenance on the above-ground storage vessels, in which the perched water is allowed to passively evaporate, is also minimal.

Media Component 2: Shallow Aquifer Groundwater

Northern Area Shallow Aquifer Remedy (2A)

The activities required for O&M of full-scale operation of the NARS include:

- Inspect components of system, and conduct service and maintenance
- Monitor and collect extraction well and treatment cell hydrologic data, including influent and effluent flow rates and water levels
- Assess aquatic vegetation health and density
- Add supplemental carbon in the form of molasses (if needed) to the denitrifying cells
- Record and report operational data
- Discharge water from the last treatment cell (Final Denitrification Area) to the primary effluent discharge location or secondary location (if necessary due to treatment upset conditions)
- Perform field and laboratory water quality monitoring

Through May of 2012 the total mass of nitrate-N removed from the shallow aquifer since pumping commenced in 1997 is estimated to be approximately 360,000 pounds. A total of 255,639,230 gallons have been extracted by SEW-1 since pumping commenced in 1997.

Operational costs for the NARS over the FYR time period are included in Table 4-1 (ANPI 2012).

Table 4-1 Operations and Maintenance Costs for the NARS	
Year	Costs (thousands $)
2007	113
2008	100
2009	77
2010	92
2011	89
2012 (estimated thru May 2012)	26

Groundwater sampling of the monitoring wells and private water supply wells, as well as the surface water of the San Pedro River, is being performed by the ANPI contractor, Hargis and Associates. O&M costs for monitoring (costs include the costs for monitoring the Southern Area shallow and perched aquifers and the San Pedro River surface water) are included in Table 4-2 (ANPI, 2012).

Table 4-2 Combined Monitoring Costs for the Northern and Southern Area Groundwater	
Year	Costs (thousands $)
2007	107
2008	120
2009	143
2010	127
2011	112
2012 (estimated thru May 2012)	72

Southern Area Shallow Aquifer Remedy (2B)

Because the remedy for the Southern Area is MNA, no active treatment requiring O&M of a treatment system is being conducted. The only O&M conducted by ANPI is groundwater monitoring for water levels, and sample collection for nitrate and perchlorate concentrations. Costs for the monitoring over the FYR time period are included in Table 4-2 above (ANPI, 2012).

Media Component 3: Inactive Ponds

The re-grading and capping of the inactive ponds, including Pond 7 and the Dynagel Pond, were completed in August 2007. O&M of the native soil cap (primarily erosion and vegetation control) began on an annual basis once construction was completed. ANPI also completed an annual Pond Cover Inspection Report for the DEUR beginning in January 2009 for year 2008. Subsequently, annual Pond Cover Inspection Reports have been completed in January of each year during this five year review period. Costs for monitoring and the operations and

maintenance of the pond covers over the FYR period are included in Table 4-3 below (ANPI, 2012).

Table 4-3 Monitoring and O&M Costs for the Pond Covers	
Year	Costs (thousands $)
2007	30
2008	4
2009	5
2010	6
2011	5
2012 (estimated thru May 2012)	2.5

5.0 Progress Since the Last Review

The protectiveness statement from the second FYR for the Apache Superfund Site stated the following:

> *"All immediate threats at the Site have been addressed. The remedy is protective in the short term for both groundwater and soils because exposure pathways that could result in unacceptable risks are being controlled. In order for the remedy to remain protective in the long-term, Institutional Controls (ICs) must be put in place restricting access to the contaminated shallow aquifer for drinking water purposes and restricting access to pond soils on-site where residual contamination has been capped*."

Status of Issues and Recommendations from Second (2007) FYR

The following issues were identified in the 2007 FYR.

- Long-term ICs have not been implemented yet for the groundwater or soils remedies. ICs need to be put in place at the Site.

  Status: Long-term ICs were implemented at the Site for both the groundwater and the soils remedies in 2008. On September 2008, ANPI and ADEQ signed a DEUR for these two media areas.

- The groundwater model for the Northern Area needs to be updated with new data.

  Status: In the intervening years since the 2007 FYR, the Northern Area groundwater concentrations for nitrate have been declining as predicted by the earlier groundwater model, and therefore it was determined that there was no need to update it.

- In the Northern Area, additional monitoring of the interface and hydrogeological impact of the effluent discharge from the wetlands system on the San Pedro River water and

shallow water sub-flow is needed to demonstrate that optimum capture not dilution is occurring.

Status: As previously stated, since the 2007 FYR, the Northern Area groundwater concentrations for nitrate have been declining as predicted by the earlier groundwater model and capture analysis. These declines are due to capture of the contaminated groundwater by SEW-1, not due to dilution. Re-evaluation of the radius of influence of the prior groundwater model in 2008 indicated that the extraction system is operating at optimum efficiency for capturing the residual contamination, and not inappropriately capturing San Pedro sub-flow.

6.0 Five Year Review Process

Administrative Components, Community Notification, Document Review

In April 2012, EPA Region 9 published an announcement in the *San Pedro Valley News - Sun* newspaper that the third FYR was underway. The FYR Analysis contains a review of relevant documents (see Attachment B, List of Documents Reviewed for FYR). Input on the performance of the remedy was sought through technical survey forms sent to ADEQ, ANP, ANPI's Contractor and EPA's contractor, as well as other personnel familiar with the site. Discussions were held with the ADEQ project manager, the ANP Environmental Health and Safety Manager and staff, the ANPI's consultants, Hargis + Associates, and EPA's contractor, Innovative Technical Solutions, Inc. (ITSI). EPA received no comments from the general public about the FYR. A site inspection also was conducted by ITSI on June 12, 2012. A copy of the Site Inspection Report is attached to this FYR (see Attachment C). EPA also plans to announce completion of this third FYR Review in the *San Pedro Valley News – Sun* after it has been approved, and distribute a Community Fact Sheet with the findings.

Data Review

Analysis of groundwater and surface water trends was conducted by EPA during the FYR evaluation and the detailed findings are included in the Groundwater Data Evaluation (Attachment A). The overall findings are described below.

Northern Area Groundwater

In the Northern Area, the majority of the surface water, monitoring and private wells that have been sampled show decreasing nitrate concentrations since the last FYR in 2007. The farthest downgradient wells network consisting of private wells (D(17-20)25bad), (D(17-20)24ccd), (D(17-20)23acd), and (D(17-20)23ada), located beyond the influence of the extraction well SEW-1 and covered by the MNA remedy for this far northern area, now all show concentrations

below the MCL for nitrate. The remedial groundwater cleanup standards in this far northern area have been met.

The wells that continue to show high nitrate levels are MW-35 and MW-36, located near the area along the San Pedro referred to as the "hot spot." Nitrate concentrations have decreased from 2007 from an average of 200-400 ppm nitrate to 100-200 ppm nitrate in 2012, but these concentrations are still quite elevated. For a detailed discussion of the Northern Area, see Attachment A (Groundwater Data Analysis) to this 2012 FYR Report.

Southern Area Groundwater

In the 2007 FYR it was determined that because the Southern Area Groundwater (both the perched zone and the MCA) is isolated from the San Pedro River and there are no private water supply wells in the aquifer, there was low potential for exposure to the residual contamination in this area.

During the current FYR period (2007 to 2012), the groundwater levels in the Southern Area are decreasing due to the continued dewatering of the perched zone, and the lack of recharge and on-going drought conditions in Arizona, which are impacting the MCA. However, the nitrate and perchlorate concentrations in the Southern Area are generally increasing. The contaminant trend lines are remaining elevated or increasing in the three MCA monitoring wells still relied upon for monitoring (MW-21, MW-23, MW-39). During this review period, it also has been determined that MW-24 located at the northern most point of the MCA is hydraulically isolated from the rest of the MCA. And MW-15 has so little water remaining that it can no longer be sampled.

However, although monitoring data indicate increasing concentration trends, this does not indicate increasing mass into the hydraulically contained Southern Area. Instead the increasing trends are attributed to a "concentration stratification" effect with the COCs concentrating at the bottom of the well screen because clean water was later discharged into the perched zone, which then migrated into the MCA and is layered on top of the more contaminated water. It is also noted that while the nitrate concentrations are increasing in the MCA, the perchlorate upward trend has somewhat stabilized in recent years. Further monitoring will be necessary to evaluate whether these trends will continue. Further analysis will also be needed to determine whether other methods may be needed to accelerate the MNA cleanup in the MCA portion of the Southern Area.

Analysis of the Southern Area data from the remaining wells (located in the MCA) that can be sampled indicates that the projected cleanup time is now 100 years instead of 30 years for MNA if no further actions are taken to enhance the remedy (H+A, 2012). ANPI has informed EPA that it determined that this extended cleanup time frame does not meet their expectations. In August 2012, ANPI presented a preliminary proposal to EPA and ADEQ for an in situ treatability study for the Southern Area. For a detailed discussion of the Southern Area Groundwater trends, see Attachment A, Groundwater Data Analysis.

Site Inspection

The site visit was performed by EPA's contractor, Innovative Technical Solutions, Inc. (ITSI) at the ANPI Site on June 12, 2012. The NARS system, including the wetlands, selected locations of the Northern Area and Southern Area monitoring network and the capped ponds were visited. EPA, and its contractor ITSI, participated in the inspection of the ponds. ADEQ participated with EPA and ITSI in the inspection of the wetlands system. ANPI personnel, and their contractor, Hargis and Associates, were also present during the site inspection. Details of the site visit are included in the Site Inspection Report and Site Checklist in Attachment C of this FYR. One issue from the Site Inspection was that the collection system for the Perched Zone groundwater could be expanded to optimize the collection of the residual perched zone water. The current collection system is not adequate for maximizing the extraction and evaporation of perched groundwater. The system is limited by an insufficient quantity and type of open containment tanks (shallow pan-type tanks versus larger, deeper tanks). Consideration should be given to expanding and optimizing the system.

Interviews

EPA sent site technical assessment survey forms to eight parties (State agency, contractors, consultants, etc.) familiar with the Site cleanup. Generally, the parties are satisfied with the remedial actions taken to date, although there were some acknowledgements that enhancements may be needed to accelerate the cleanup time for the Southern Area MNA remedy. The technical assessment survey forms are included in Attachment D.

7.0 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedy is functioning as intended for the Northern Area groundwater. SEW-1 is extracting groundwater from the area of high nitrate concentrations in the Northern Area. Since full-scale operation of the NARS was achieved in June 2005, the wetlands treatment is operating as intended by treating effluent consistently below the discharge criteria specified in the ROD and ROD Amendment.

In the Southern Area, stopping discharge of wastewater to the unlined evaporation ponds in 1995, combined with ongoing extraction of groundwater from the perched aquifer, has resulted in continuing decreased water levels in the perched zone and the adjacent MCA. With continued dewatering, the perched zone may become dry and contaminants immobile by the time of the next FYR. The water levels in the adjacent MCA in the Southern Area should also continue to decrease, unless the current drought conditions should change and there is unexpected recharge into the MCA and the perched zone.

However, as indicated above, the progress toward achieving the goal of dewatering the MCA is slow and the projected timeframe for MNA in the Southern Area (MCA) is long. Monitoring

data indicate increasing concentration trends; however, this does not indicate increasing mass into the closed basin. Instead the increasing trends are attributed to a "concentration stratification" effect with the COCs concentrating at the bottom of the well screen, as previously discussed. It is also noted that while the nitrate concentrations are increasing, the perchlorate upward trend has somewhat stabilized in recent years.

The 1994 ROD identified the need for ICs to limit exposure to contaminants and prevent disturbance of the soil caps on the inactive ponds. The ROD also called for ICs to prohibit the use of the shallow aquifer groundwater for drinking purposes. A DEUR for both groundwater and soils was placed on the ANPI property in 2008.

Access to the ANPI facility is restricted by existing high-security perimeter fencing surrounding the 20-acre operations area of the facility. There is additional perimeter fencing around the entire 1,100 acre property. There is a guarded entrance gate and sign-in building for any business or facility visitors who need to access the operations area of the facility. The perimeter and outlying areas of the facility are patrolled regularly by facility personnel. Bi-lingual signage is also highly present at the Site for restricted areas, such as the capped ponds and the wetlands area.

Ongoing education and outreach inform nearby residents and property owners of the extent of the contaminated shallow aquifer groundwater plume, as required under the Community Relations Plans required for the ICs. ANPI also submitted an updated Alternate Domestic Water Supply Plan in 2009. An annual updated Well Inventory is also required as part of the ICs, which ANPI has been submitting on an annual basis.

Question B: Are the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of remedy selection still valid?

There have been no changes in the ARARs that should affect the protectiveness of the remedy and there have been no changes in standards or To Be Considered (TBCs) for the Site. The ARARs are considered to be health protective and reasonable in evaluating risk for this site. There have been no changes in the toxicity factors or other contaminant characteristics that could affect the protectiveness of the remedy.

There has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy; however, the 1992 Baseline Preliminary Health Assessment/ Environmental Assessment (BPHE/EA) was conducted prior to implementation of current guidance for human health and ecological risk assessments.

Substantial progress has been achieved since implementation of the remedy toward meeting the Remedial Action Objectives (RAOs) for the Northern Area groundwater, with more limited progress for the Southern Area groundwater remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No information has come to light that could call into question the protectiveness of the remedy.

Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the groundwater remedy is functioning as intended by EPA's remedy decision documents in the Northern Area, but not as quickly as expected in the Southern Area. However, because the perched zone and MCA are hydraulically isolated and there are no drinking water wells within the Southern Area, the functioning of the Southern Area remedy is not impacting public health, only long-term monitoring costs. There have been no changes in the ARARs that would affect the protectiveness of the remedy. The assumptions used in determining exposure pathways are considered to be health protective and reasonable in evaluating risk for this site. There have been no changes in the toxicity factors or other contaminant characteristics that could affect the protectiveness of the remedy and there has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

8.0 Issues

There are no issues that affect protectiveness at the Apache Powder Superfund Site.

9.0 Recommendations and Follow-Up Actions

Although there are no issues that affect protectiveness, this Review includes additional suggestions for accelerating site close-out and improving the effectiveness of the Site remedy.

Remedy enhancements, such as in-situ treatment, should be considered for MNA Remedy for Southern Remedy Molinos Creek Sub-Aquifer (MCA)

The nitrate and perchlorate-contaminated groundwater in the Southern Area that is hydraulically contained in the MCA has been showing increasing concentrations in some wells, and level or decreasing concentrations in other wells. These fluctuations have been attributed to a "concentration stratification" process occurring in specific wells as the overall area has been dewatering due to active pumping or due to evapo-transpiration and phytoremediation processes. However, the current selected remedy of MNA may not be able to clean up the Southern Area and meet cleanup standards as quickly as originally projected. Pilot studies for in-situ remediation to enhance the MNA remedy have been proposed by ANPI for the MCA, as the Southern Area continues to be monitored. See Appendix A, Groundwater Data Analysis, for more details.

Expanding the number or modifying the open containment tanks should be considered for maximizing extraction and evaporation of the Perched Zone Groundwater

The current collection system is not adequate for maximizing the extraction and evaporation of perched groundwater. The system is limited by an insufficient quantity and type of collection vessels. Two deep, above-grade, open tanks are currently being used to collect the extracted perched groundwater, while previously multiple shallow pan-type tanks were used. See Site Inspection Report (Attachment C) for a picture of the open tanks. The rate of extraction was reduced in 2010-2011 due to several factors, including the limitations on the tank capacity and the slow evaporation rate. It appears that greater surface area and shallower containment tanks could speed up the evaporation rate. Consideration should be given to modifying and expanding (with a greater number of shallower tanks) the system to further optimize the dewatering process.

10.0 Protectiveness Statement

The remedy at the Apache Powder Superfund Site is protective of human health and the environment for both groundwater and soils because there is no current exposure. The ICs restricting access to the contaminated shallow aquifer for drinking water purposes and restricting access to former pond soils on-site where residual contamination has been capped were put in place in 2008.

11.0 Next Review

The next FYR for the Apache Powder Superfund Site is required by September 2017.

Apache Powder Superfund Site
Third Five-Year Report

Figure 1
Map Showing Site Location Site Location

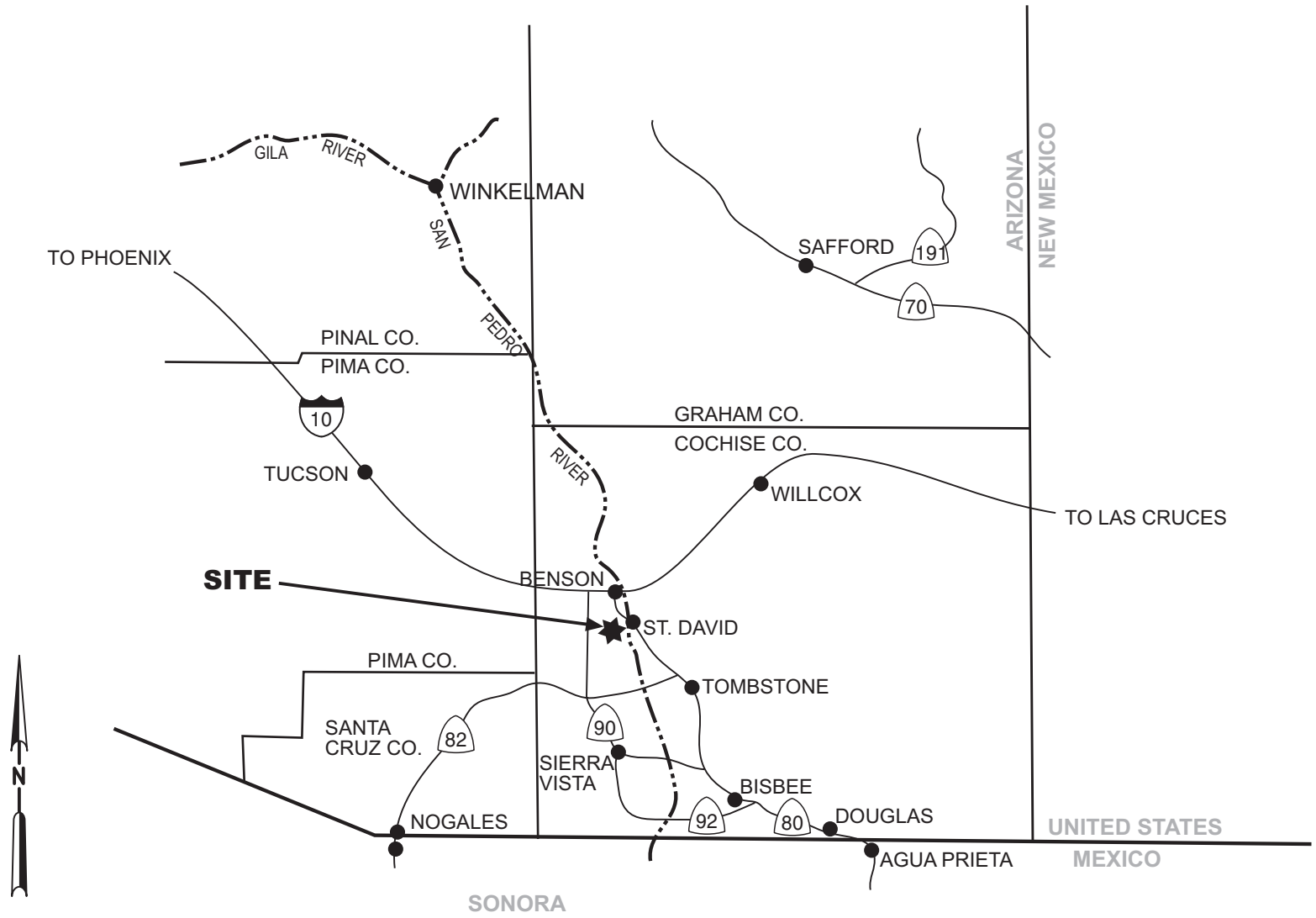


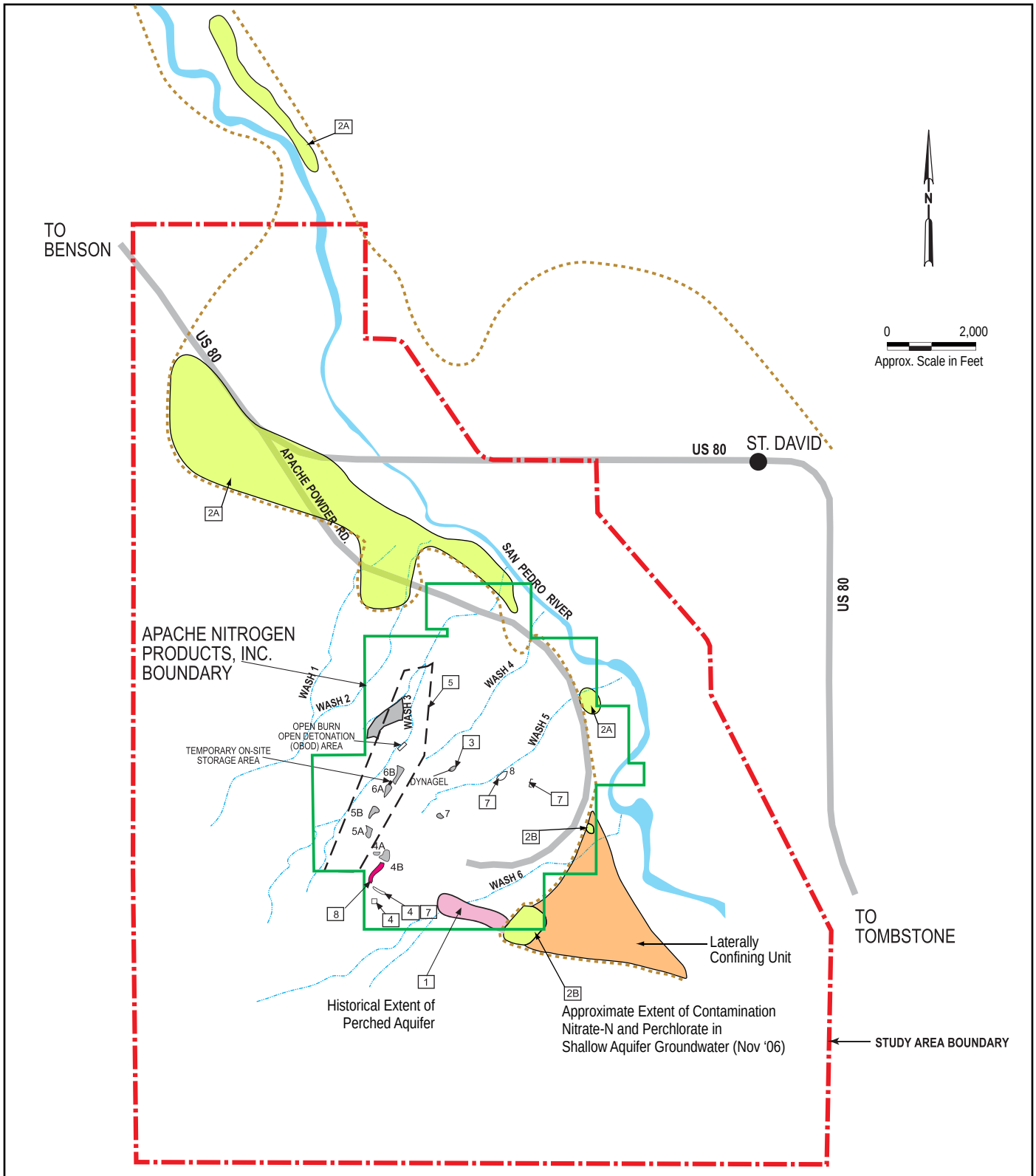
FIGURE 1
SITE LOCATION MAP
APACHE POWDER SUPERFUND SITE
NTS

CH2MHILL

1086_02.FH8 (12/17/99)

Apache Powder Superfund Site
Third Five-Year Report

Figure 2
Map of Study Area



EXPLANATION

- WASH
- RAILROAD TRACKS
- ROAD
- STUDY AREA BOUNDARY
- MCL MAXIMUM CONTAMINANT LEVEL
- MG/L MILLIGRAMS PER LITER
- APPROXIMATE BOUNDARY OF SHALLOW AQUIFER
- NITRATE-N NITRATE AS NITROGEN
- APACHE NITROGEN PRODUCTS, INC. BOUNDARY

MEDIA COMPONENTS - REMEDIAL ACTION

- 1 PERCHED GROUNDWATER
- 2A NORTHERN AREA SHALLOW AQUIFER GROUNDWATER
- 2B SOUTHERN AREA SHALLOW AQUIFER GROUNDWATER
- 3 INACTIVE PONDS (INCLUDES PONDS 4A, 4B, 5A, 5B, 6A, 6B, 7, 8, AND DYNAGEL POND)
- 4 WHITE WASTE AND DRUM STORAGE AREA
- 5 WASH 3 AREA (EXCLUDING OBOD AREA)
- 7 DNT DRUMS LOCATED OUTSIDE OF THE WASH 3 AREA

MEDIA COMPONENTS - REMOVAL ACTION

- 8 TRINITROTOLUENE (TNT) -CONTAMINATED AREA

FIGURE 2
STUDY AREA MAP
Apache Powder Superfund Site
Saint David, Arizona

CH2MHILL

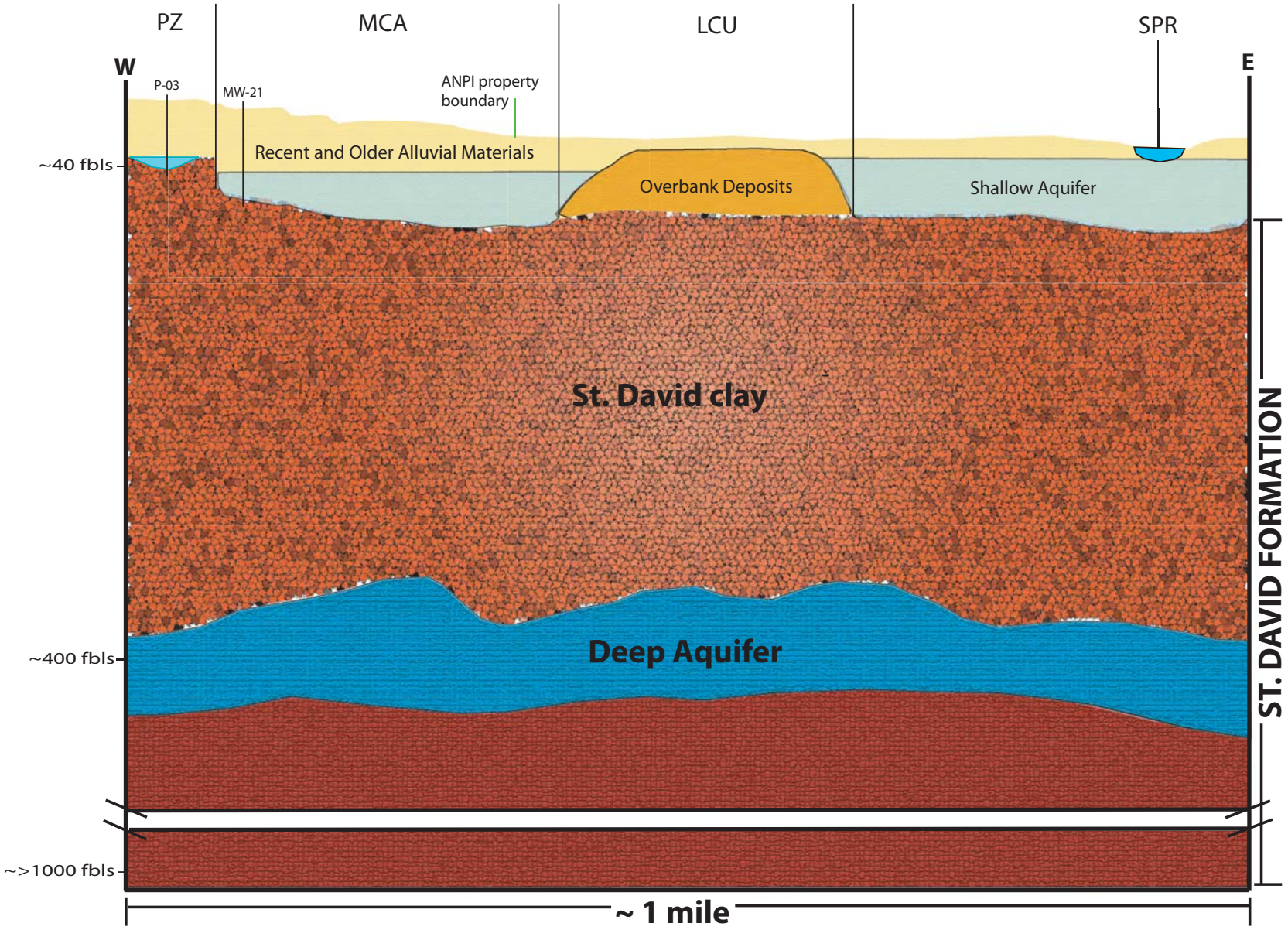
ES042007001PHX/Apache Powder_Saint David_study area site3.ai (9/07)

Apache Powder Superfund Site
Third Five-Year Report

Figure 3
Conceptualized Hydrogeologic Cross Section Through the Southern Area

HARGIS+ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

CONCEPTUALIZED HYDROGEOLOGIC CROSS-SECTION THROUGH THE SOUTHERN AREA APACHE POWDER SUPERFUND SITE



EXPLANATION

ANPI	= Apache Nitrogen Products, Inc
fbls	= feet below land surface
LCU	= Laterally Confining Unit
MCA	= Molinos Creek Sub-Aquifer
MW-21	= Monitor Well MW-21
P-03	= Piezometer P-03
PZ	= Perched Zone
SPR	= San Pedro River

NOT TO SCALE

Apache Powder Superfund Site
Third Five-Year Report

Appendix A
Groundwater Data Analysis

APPENDIX A

GROUNDWATER DATA ANALYSIS – APACHE POWDER SUPERFUND SITE

SITE HISTORY AND BACKGROUND INFORMATION

Site Location

The Apache Powder Superfund Site is located in Cochise County, Arizona, approximately seven miles southeast of the incorporated town of Benson, Arizona and 2.5 miles southwest of the unincorporated town of St. David (see Figure 1). The Site study area includes approximately nine square miles and includes 1,100 acres of land owned by Apache Nitrogen Products Inc. (ANPI), formerly known as the Apache Powder Company. The San Pedro River National Conservation Area, owned by the Bureau of Land Management, is located approximately two miles south of the site along the San Pedro River. The San Pedro River runs south to north along portions of the eastern boundary of the ANPI property.

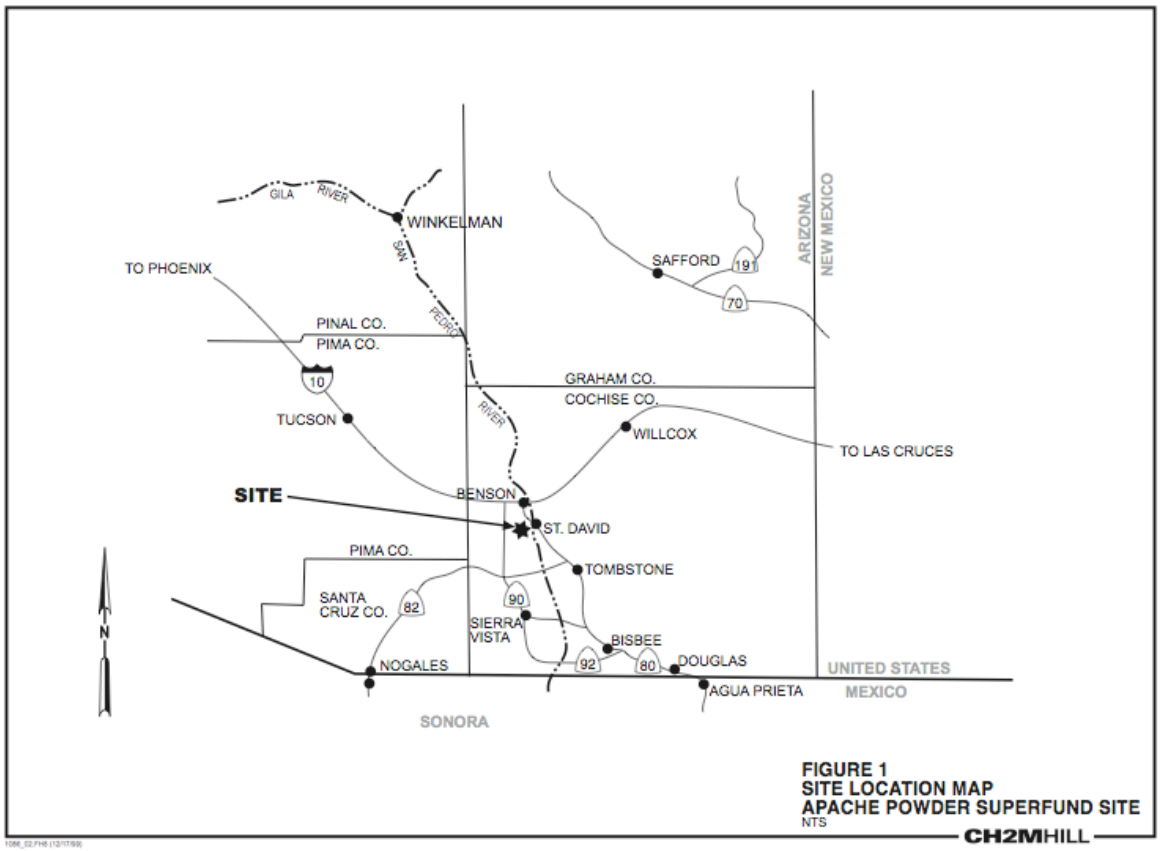


Figure 1. Site Location Map (Source: EPA, 2007).

ANPI's Manufacturing Activities

In 1922, ANPI began manufacturing industrial chemicals and explosives, including nitroglycerin, nitric acid, ammonium nitrates, and blasting agents. Presently, ANPI continues to manufacture solid and liquid ammonium nitrate, ammonium nitrate-based fertilizers, nitric acid and aqua ammonia primarily for agricultural and mining customers. Historically, these operations produced both liquid and solid wastes, of which some were disposed of on ANPI property. These past use and disposal practices resulted in contamination of soils on the facility and groundwater contamination in a perched system underneath the plant's operations area, in the nearby shallow aquifer and the San Pedro River. The groundwater contaminants in the Southern Area of the site are nitrate and perchlorate. The shallow aquifer groundwater is contaminated only with nitrate in the Northern Area of the Site.

Regional Geology and Hydrogeology

The Site is located in the Upper San Pedro River Basin, which is situated within the Basin and Range physiographic province. The Basin and Range province is typified by broad, gently sloping alluvial basins separated by north-northwest trending crystalline fault block mountains. The basins were created by the subsidence of structural grabens along high-angle normal faults. Sedimentation within the grabens coincided with the gradual subsidence, resulting in a thick sequence of fine- to coarse-grained late Cenozoic terrestrial sediments derived from the igneous, metamorphic, and sedimentary rocks of the surrounding mountain range. Due to the closed drainage environment during subsidence, sediments deposited gradationally, with the coarse-grained sediments near the mountains and fine-grained sediments near the basin centers. The thickness of the alluvial sediments in the Basin (the St. David Formation) is unknown, but is thought to be greater than 1,000 feet near the center of the basin, thinning to a veneer along the mountain fronts. Extensive fine-grained units overlying coarser grained sediments produced confined conditions in the center of several basins. The St. David Formation in the Basin is one such extensive fine-grained unit, producing confined conditions in the center of the Basin surrounding the Site (H+A, 2007a). See Figure 2, Conceptual Hyydrogeologic Cross-Section of the Southern Area.

San Pedro River

The dominant surface water drainage feature in the Basin is the San Pedro River. Its overall watershed is approximately 2,500 square miles, including 700 square miles in Mexico. The San Pedro River originates near Cananea, Sonora, Mexico, approximately 65 miles south of the Site, and flows north to join the Gila River near Winkelman, Arizona. The ancestral San Pedro River began depositing recent flood-plain sediments throughout a period of aggradation during the last 10,000 years. As the fluvial dynamics of the region changed from an erosional to a depositional environment, the surface water flow patterns were controlled by the paleo-channels. This resulted in the deposition of coarse-grained sediments in the paleochannels and fine-grained sediments between the paleochannels through lateral and vertical accretion (H+A, 2007a).

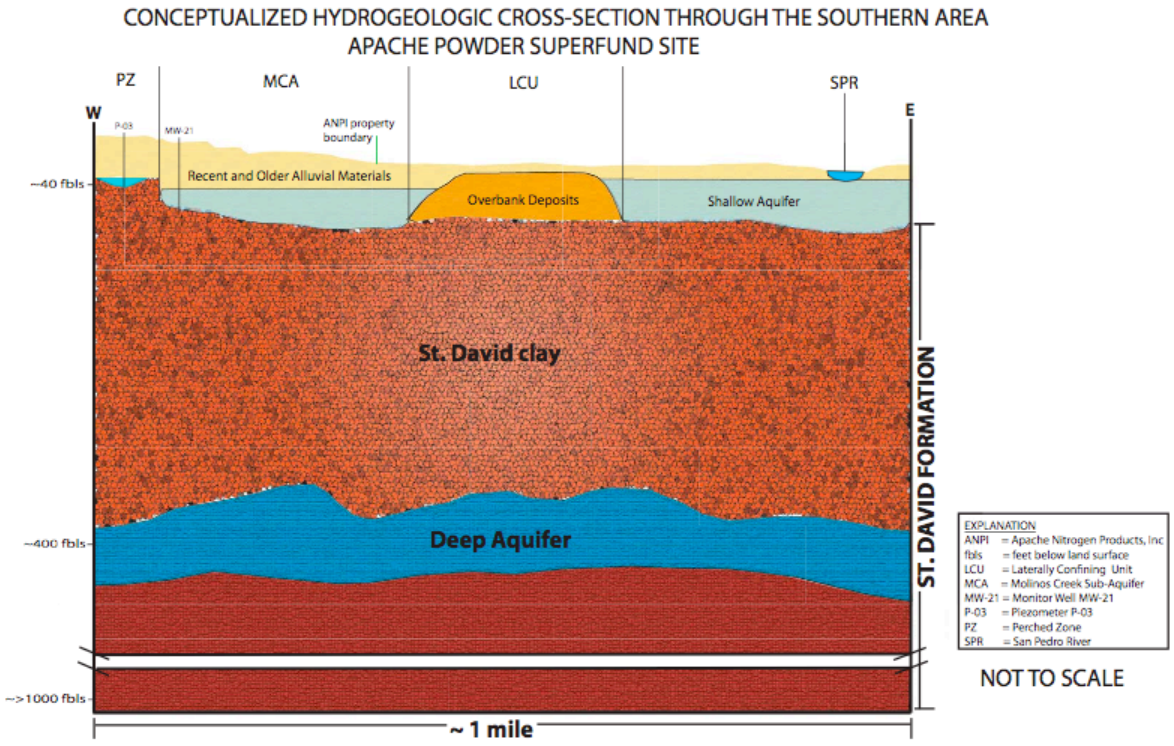


Figure 2, Conceptual Hydrogeologic Cross-Section of the Southern Area
(Source: Hargis + Associates, 2012)

ANPI's Groundwater Usage

Throughout its operational history, ANPI has relied on groundwater for industrial, landscape irrigation, and drinking water uses. Industrial use, landscape irrigation, and drinking water supplies are derived exclusively from wells tapping the deep, regional, aquifer located within the St. David Formation, with the exception of process waters that are treated and recycled via the brine concentrator. The brine concentrator was installed in 1995 by ANPI to treat wash-down waters from the on-going manufacturing operations. Shallow aquifer or perched groundwater is not and never has been used by ANPI for any of these purposes (H+A, 2007a),

ANPI's Wastewater Discharge Activities

From 1922 until 1971, manufacturing wastewater was routed via ditches to washes that discharged to the San Pedro River (see Figure 3). These dry wash tributaries of the San Pedro River were informally numbered from north to south by EPA as Washes 1 through 6. Most manufacturing wastewater was discharged to Washes 5 and 6, which drain the watersheds in which most of the ANPI operations are situated. Wash 4 also received discharge waste streams from historical operations, but such operations were discontinued by the early 1990's. According to historical accounts, no wastewater is believed to have discharged into Washes 1 and 2, which drain the northernmost areas of the site (see Figure 3). All the washes received natural overland runoff from the site and adjacent parts of their watersheds. Industrial waste streams from historical ANPI

operations comprised mainly washdown and blowdown waters from the power house cooling tower, nitric acid plant, loading/unloading, and raw material and product storage areas (H+A, 2007a).

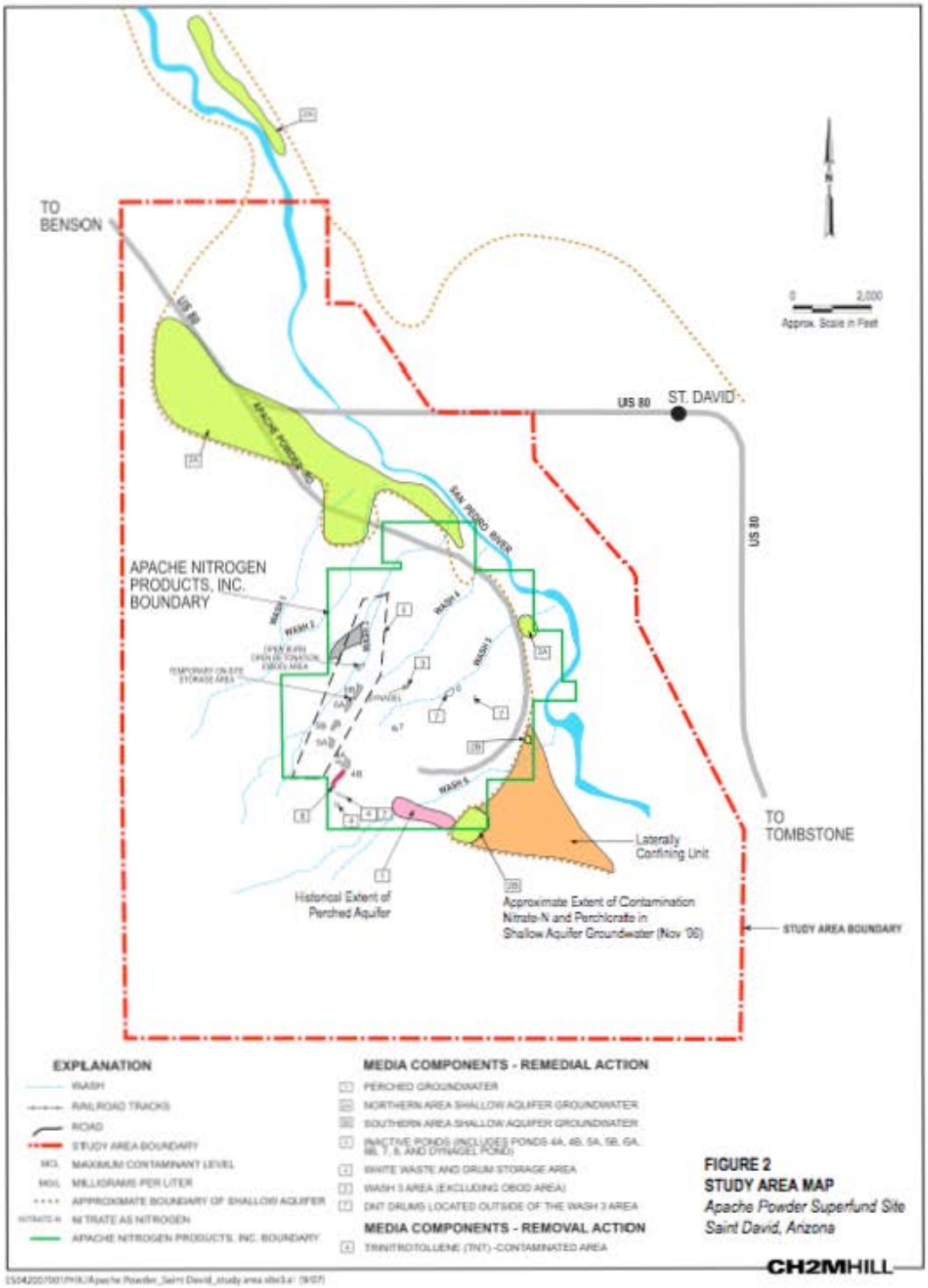


Figure 3. Study Area Map Showing Location of Washes leading to San Pedro River (Source: EPA, 2007).

From 1971 to 1995, ANPI used unlined evaporation ponds throughout the site and wastewater was routed via unlined channels to several of these ponds). Ponds 1A, 1B, 2A, 2B, 3A, and 3B received the bulk of the wastewaters. These ponds are located south of the Site Operations Area within the Wash 6 watershed (H+A, 1991, 2000a). Additionally, Ponds 9, 9A, and 9B received wastewater from the Cord Plant until it was closed in the early 1990's. Wastewater from the Prill Plant was routed to Pond 7, and wastewater from the Dynagel Plant was routed to the Dynagel Pond for a time. Both the Prill and Dynagel operations were located in the Wash 5 watershed (H+A, 2007a).

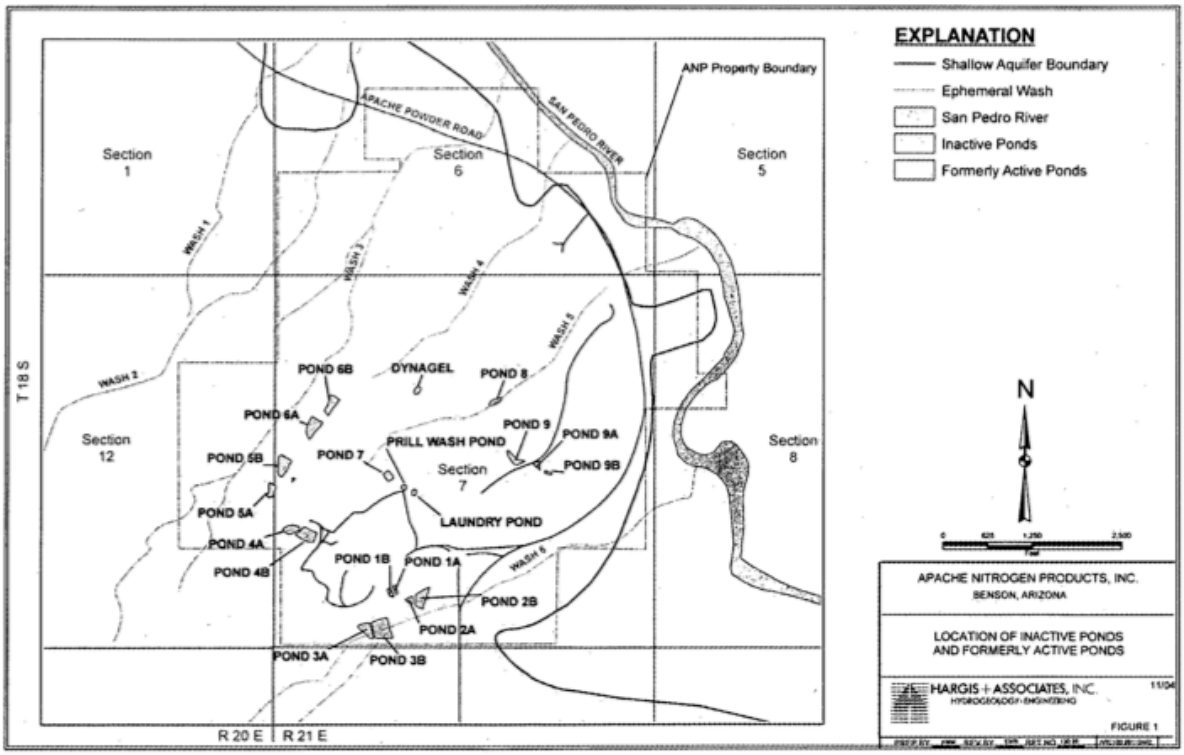


Figure 4. Location of Evaporation Ponds (Source: H+A, 2008a)

During their active use, impounded wastewater and wastewater flowing in the unlined channels infiltrated into the underlying coarse terrace deposits. Downward percolation of the wastewater was eventually impeded upon encountering the St. David clay, the uppermost fine-grained stratum of the St. David Formation, forming a dense, aquitard. As the volume of water infiltrating increased, a "mound' of water formed and began to spread laterally, creating what is now known as the perched groundwater zone. This effect was particularly prominent in the vicinity of Ponds IA, IB, 2A, 2B, 3A, and 3B, which received the bulk of the wastewater discharge. Perched groundwater most likely also developed beneath Ponds 7, 9, 9A, 9B, and Dynagel, but to a much lesser extent (see Figure 4). The accreting mound of perched groundwater underlying the former group of ponds is known to have migrated laterally eventually discharging into the Molinos Creek Sub-Aquifer (MCA), a hydraulically isolated paleo-channel identified during investigations conducted in the early 2000s, located adjacent to the shallow

aquifer. It is unlikely that perched groundwater underlying the other ponds shared the same fate owing to both its lesser volume and greater distance from the MCA (H+A, 2007a).

By the early 1990's ANPI discontinued its operations involving discharges to Ponds 7, 9, 9A, 9B, and Dynagel. In April 1995 it became possible to discontinue discharge of wastewaters to Ponds 1A, 1B, 2A, 2B, 3A, and 3B due to the construction of the Brine Concentrator facility to which the wastewater stream was rerouted and which continues to receive and treat process wastewaters through the present day. The overall effect of these water management and source control operations has had the effect of allowing the previously established mound of perched groundwater in the Southern Area to recede both in saturated thickness and areal extent. In turn, the seepage of the contaminated perched groundwater into the MCA terminated (H+A, 2007a)

Impact of Waste Discharge Practices on Shallow Aquifer

Site discharges and runoff from all these operations resulted in the Southern Area perched groundwater and the adjacent Molinos Creek Sub-aquifer becoming contaminated with both nitrate and perchlorate. In the Northern Area, the shallow aquifer and the San Pedro River were contaminated with nitrate only. In the early 1990s, ANPI undertook a program in the Northern Area to replace eight privately-owned domestic supply wells by constructing new wells tapping the uncontaminated deeper aquifer after these households were provided bottled water in 1989. An Alternate Domestic Water Supply Plan has been in place since the early 1990s and has been updated during the intervening years to ensure that no households within the vicinity of the contaminated shallow aquifer consume contaminated water. As of 2012, only one household remains on bottled water in the Northern Area due to nitrate concentrations above the drinking water standard of 10 mg/L in that domestic supply well.

Site Contaminants

The waste streams containing varying concentrations of nitrate are believed to be the primary source of nitrate that is now present in Northern and Southern Area shallow aquifer groundwater. In addition to nitrate in groundwater, in 1998 perchlorate was discovered in the Southern Area groundwater both within the perched zone groundwater and the adjacent Molinos Creek Sub-Aquifer (MCA) in the Southern Area. The perchlorate-contamination resulted from the former use of saltpeter (sodium nitrate) imported from Chile by ANPI as a process feedstock. The Chilean saltpeter contained natural impurities of perchlorate. The Chilean saltpeter was used extensively by ANPI from 1922 until 1948 to manufacture nitric acid. In 1948, ANPI converted to an ammonia oxidation process to produce nitric acid. After 1948, onsite use and storage of Chilean saltpeter continued in the manufacture of dynamite until 1983 and for the manufacture of Carbagel and Dynagel products until 1987. While perchlorate was not manufactured or used intentionally at the Site, it was identified as a contaminant in the imported saltpeter.

CONCEPTUAL SITE MODEL FOR GROUNDWATER

A Conceptual Site Model (CSM) is a method used to summarize and integrate all relevant technical information about the Site to explain why the Site's conditions have led to the selection of a specific remedy for a Site. The CSM takes into consideration the Regional and Site's hydrogeology, the types of contamination present, the environmental media (soils, water, air) affected, and the remedial actions taken to date. A conceptual model for a groundwater flow and hydrologic system is an interpretation or working description of the characteristics and dynamics of the physical hydrologic system. The groundwater CSM for the Apache Powder Superfund site has been revised several times over the years as new information has become available.

1994 Original Conceptual Site Model

The original CSM, upon which the 1994 Record of Decision (ROD) was based, considered the contaminant history and the waste disposal activities which occurred at the Site. At the time, the overall premise of the CSM was that the discharge of nitrate in wash-down waters into the various washes resulted in contamination in the Southern Area, which in turn migrated northward in the San Pedro River and the nearby shallow aquifer to the Northern Area of the Site. In 1994, only nitrate was considered a COC. Perchlorate was not identified at the Site in the Southern Area until 1998.

In 1994, the CSM was comprised of the following elements:

- Historical operation of the ammonium nitrate manufacturing began in 1922.
  - Wastewater discharges from plant originally routed to unlined ditches, which led to ephemeral washes.
  - Washes were tributaries to the San Pedro River and entered into the San Pedro River alluvial floodplain. Therefore contaminants probably both infiltrated into SPR alluvium & aquifer and were transported downstream via surface water flow.
  - This created a long plume that extended both in the Southern & Northern Areas.
  - Plume moved rapidly within the alluvial system, but stagnated somewhat along the aquifer boundary. Note that the alluvium is asymmetrical, such that the San Pedro River is closer to the boundary on the Apache (west) side than on the St. David side. In all probability, the contamination "hugged" the boundary or was dispersed as it flowed in the more active part of the alluvium. (Hargis, 2012)

1998 Perchlorate Discovery Led to New Investigations

However, in 1998 when perchlorate was discovered in the perched groundwater system in the Southern Area, another round of characterization and investigation activities was conducted by ANPI to identify the extent of perchlorate contamination. Multiple studies were conducted to determine if perchlorate was present in the Northern Area or the San Pedro River, or just in the Southern Area of the Site. Other field studies were done to more fully define the extent of the Southern Area contamination. In 2003, a Southern Area Characterization Report was completed by ANPI. The Report concluded that the

Southern Area, as defined as the perched zone and the adjacent Molinos Creek Sub-Aquifer (MCA), was not hydraulically connected to the Northern Area. Perchlorate was never detected outside of the Southern Area. Consequently, the Site and the corresponding CSM evolved into a Southern Area CSM and a Northern Area CSM, with separate remedy decision documents, including separate Interim Remedial Action Groundwater Reports, being developed for each area (see Figure 6).

In 2006, additional field work resulted in further refinement of the 2003 conceptual model for the Southern Area. In general, the conceptual model for the Southern Area comprises an alluvial system that is hydraulically isolated from the alluvial aquifer in the San Pedro River. Groundwater-bearing alluvium is referred to as the MCA (Molinos Creek Sub-aquifer) as differentiated from the SPA (San Pedro Aquifer) to the east along the San Pedro River. The westward boundary of the MCA is formed at the limit of "younger" alluvial materials associated with the San Pedro River. This younger alluvium forms a contrast with older terrace deposits known informally as "granite wash" and the underlying upper St. David Formation.

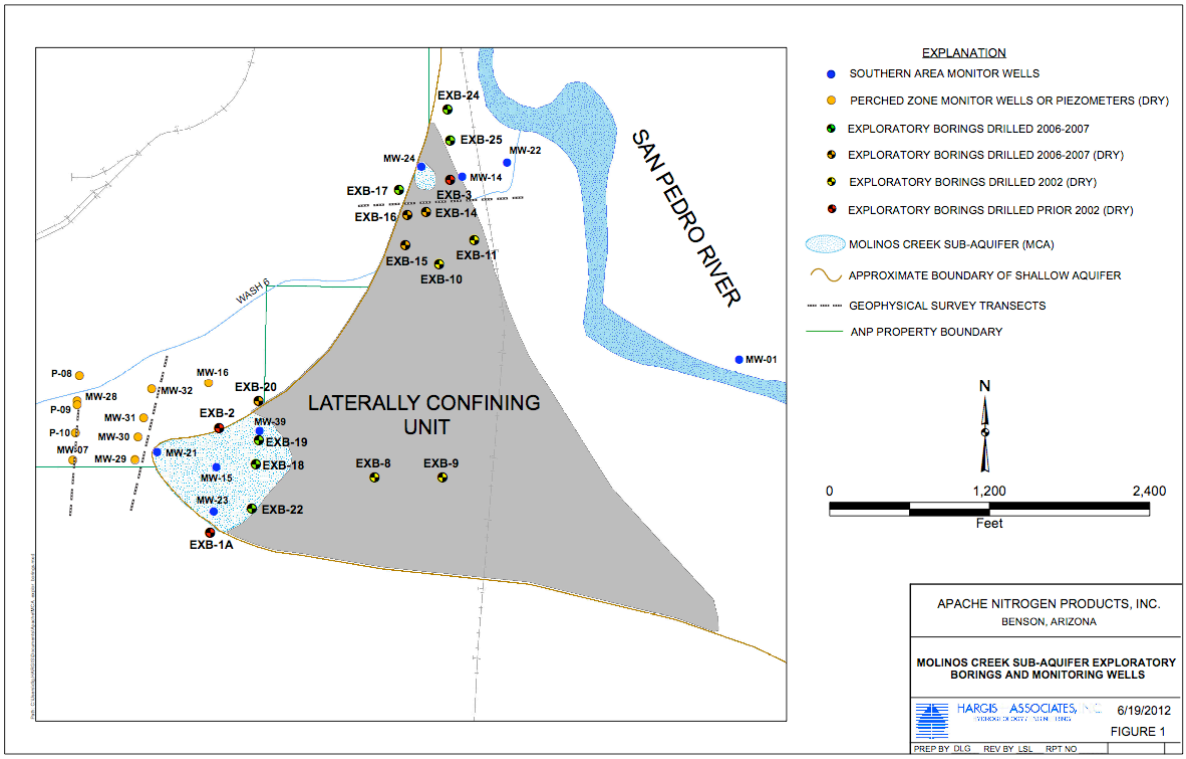


Figure 5. Molinos Creek Sub-Aquifer (MCA), Including Monitoring Well Network and Exploratory Boreholes to Define Extent of MCA (Source: H+A, June 2012).

To the east, the MCA is bounded by a fine-grained unit known as the Lateral Confining Unit (LCU), which is believed to be formed by overbank silty and clayey materials of the ancestral San Pedro River. Coarser alluvial materials in the MCA occur in distinct areas that in turn support hydraulically distinct bodies of groundwater. These areas historically are believed to have received artificial recharge in the form of runoff and wastewater discharges from the plant via surface washes and/or underground seepage

from former unlined evaporation ponds. Presently, hydrographic data indicate that groundwater in the perched zone and MCA is receding, receiving little to no recharge. Moreover, based on the flatness of the hydraulic gradients, there appears to be little if any, groundwater movement within these hydraulically isolated zones. (H+A, 2007a)

Results from the 2006 exploratory borings indicated that the LCU is more extensive than previous mappings. The exploratory borings also indicated that the MCA was not a continuous feature, but rather was separated into two hydraulically discrete areas, termed the northern and southern lobes. The investigations further defined the limited areal extent of these two lobes. The areal extent of the northern lobe is limited to a small area in the immediate vicinity of monitor well MW-24. The areal extent of the southern lobe is also smaller than previously delineated (see Figure 5). (H+A, 2007a)

The Southern Area Conceptual Site Model

As of 2012, the Southern Area CSM is composed of the following elements, building on the overall initial CSM from 1994, and subsequent studies in the 2000s, previously described:

- Around the early 1970's, wastewater discharges were rerouted to unlined ponds (mostly in the south in Wash 6 watershed). Pond 7 & Dynagel are in Wash 5 watershed (as well as most of the Powder Line).
  - ANPI still used unlined ditches to convey water to unlined ponds.
  - Ponds evaporated some water, causing concentration of chemicals.
  - Water also infiltrated creating a perched zone, which probably already was there because of infiltration through unlined ditches.
  - As perched zone mounding increased, flow began over the (buried) St. David clay surface and into the adjacent alluvium forming the MCA.
  - Water levels in the MCA increased (MW-15, MW-21, and MW-23).
- Discharge to unlined ponds was discontinued in 1995 when the brine concentrator was constructed and came on line.
  - Perched zone began to recede as a result of flow into the MCA, as well as dewatering activities (pumping of perched water into evaporation tanks) and overall regional drought conditions (lack of recharge).
  - In 1995, the last large influx of fresh water to the evaporation ponds, perched zone and MCA occurred from the pressure testing of the 1.2 million gallon brine concentrator surge tank.
  - This water went into the unlined ponds, then into the perched zone, and then flowed to the MCA.
  - During the 2000s until the present (2012), the perched zone water level elevations have continued to drop as dewatering of the perched zone continues, resulting in the discharge to adjacent MCA ceasing in about 2003.
- Presently, limited residual water in the perched zone in a few low places.
  - Water levels have been dropped as a result of (1) no source of recharge since the evaporation ponds were taken out of use in 1996, (2) active dewatering of the perched zone with low-flow extraction wells, and (3) evapo-transpiration (ET).
  - Stratification of contaminant concentrations as dewatered over time.
  - MCA is of limited areal extent and hydraulically isolated as a result of the LCU.

- MCA water levels have also receded over time.
  - Result of (1) no recharge from the perched zone once those water levels dropped, (2) ET losses, and (3) infiltration into underlying and adjacent low permeability units.
  - Stratification of contaminant concentrations in MCA due to the sequence of influent water quality. Older discharges from perched zone were more concentrated with site contaminants, and newer discharges (such as the freshwater from brine concentrator) were less so. This same phenomenon is observed in the perched zone.
  - As of 2012, estimated quantity of water in MCA is about 100 acre feet.
- Perchlorate is limited to Southern area as a result of its geographic usage on the plant as well as its use timeframe in plant production history.
  - In 1998, perchlorate was discovered in perched zone, and later in MCA.
  - Limited areal extent of perchlorate may be a further indication of the isolation of the MCA, or the effect of the aquifer's dispersive mechanisms acting on the comparatively lower concentrations of perchlorate in the wastewaters.
  - Note: perchlorate is about 3 orders of magnitude lower in concentration than nitrate. (Hargis, 2012)

The Northern Area Conceptual Site Model

As of 2012, the Northern Area CSM builds on the historical development of the plume and the CSM from 1994 previously described, with some additional elements based on field studies and monitoring activities conducted during the intervening years, as outlined below:

- Historically, as previously described, ANPI released wastewater via ditches to several washes that discharged to shallow aquifer alluvium and the San Pedro River.
- Pond 7 and the Dynagel pond are in the Wash 5 watershed (as well as most of the Powder Line). Wash 5 is located to the north much closer to the Northern Area than the other washes.
- In the early 1970s, wastewater discharges were rerouted to unlined evaporation ponds, and the earlier practice of discharges to washes ceased.
- A residual "hot-spot" at the base of Wash 3 (downgradient from Wash 5) appears to have captured nitrate from wash-down waters historically released down Wash 5 in subsurface soils and sediments. Known area of plume discharge along SW-3/4 reach.
- No perchlorate has been detected in the Northern Area.
- Alternating reaches of recharge and discharge exist along the San Pedro River (intermittent stream).
- Stagnant areas along aquifer boundary (in the keyhole area west of extraction well SEW-1, known as the Carnes area) where contaminants persist.
- Variable heterogeneities also contribute to irregular distribution of contamination.
- Some irrigation pumping during dry periods contributed to further spreading to the north prior to establishing hydraulic control by the Northern Area Remediation System (NARS). (Hargis, 2012)

AREAS OF GROUNDWATER CLEANUP

There are two major areas of groundwater cleanup underway at the Apache Powder Superfund Site: the Northern Area and the Southern Area (see Figure 6). Analyses of groundwater and surface water trends were conducted by the U.S. Environmental Protection Agency (EPA) during the five-year Review (FYR) evaluation process for 2007 through 2012. The overall findings are described below.

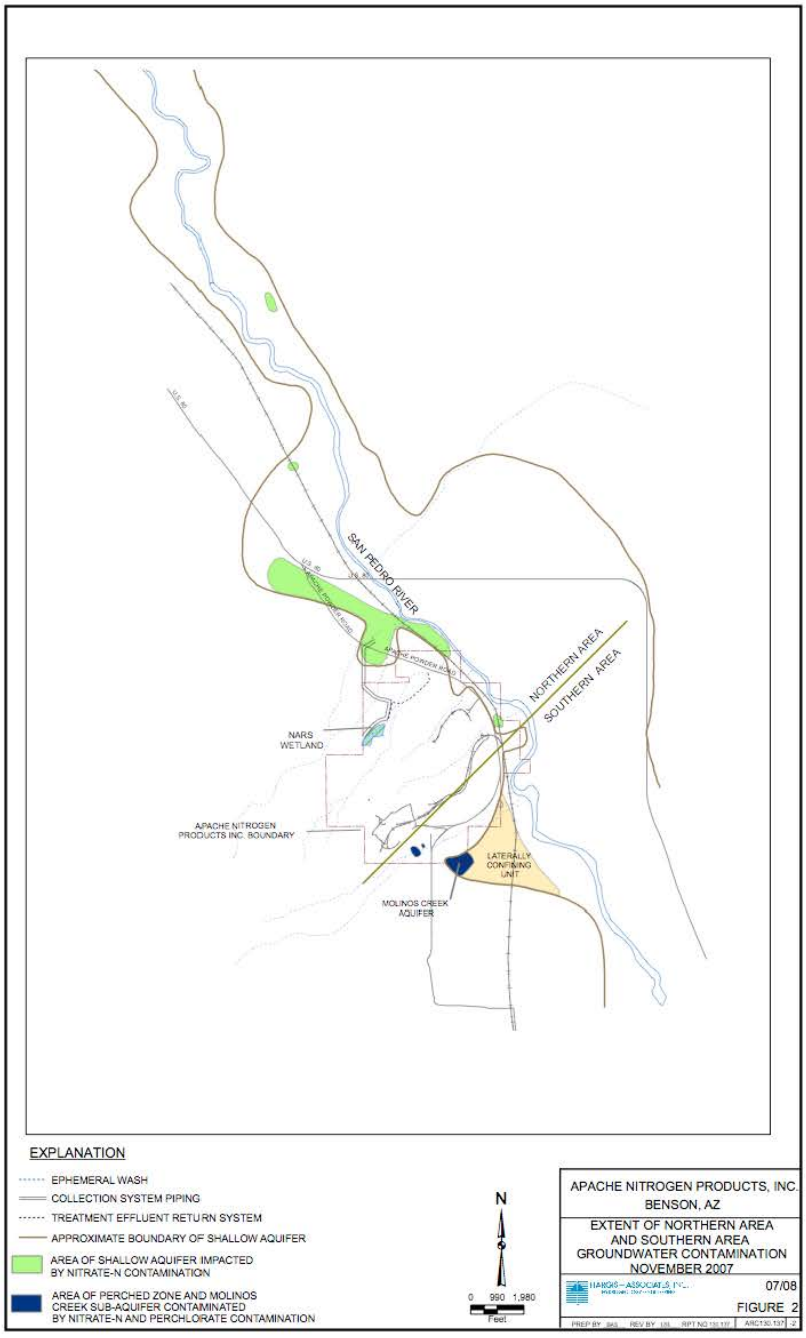


Figure 6. Map Showing Northern and Southern Groundwater Areas (Source: H+A, 2009)

NORTHERN AREA GROUNDWATER

The Northern Area remedy comprises two hydraulically connected geographic areas with different remedies for cleaning up the nitrate-contaminated groundwater:

- The NARS (Northern Area Remediation System) area within the capture zone of extraction well SEW-1. The remedy for this area is pumping the contaminated shallow aquifer and treating it in a constructed wetlands.
- The MNA area downgradient beyond the influence of the capture zone. The remedy for this area is monitored natural attenuation (MNA).

There is a third geographic area within the Northern Area upgradient of the NARS area along the San Pedro River near Wash 3 in the vicinity of MW-36 (commonly referred to as the nitrate "hot-spot"). The conceptual site model (CSM) for this area indicates that the nitrate is slowly moving downgradient (northward) within the shallow aquifer sub-flow along the western boundary of the San Pedro River, where it is then captured by SEW-1.

Northern Area Groundwater Status During 2007 FYR

At the time of the 2007 FYR, the majority of the surface water, monitoring wells, and private wells that were sampled in the Northern Area showed decreasing nitrate concentrations.

In 2007, the farthest downgradient wells in the Northern Area consisted of private wells D(17-20)25bad, D(17-20)24ccd, D(17-20)23acd, and D(17-20)23ada with nitrate concentrations below the maximum contaminant level (MCL) of 10 milligrams per liter (mg/L). To evaluate the efficacy of the NARS, more monitoring was recommended to see if long-term decreasing trends were achieved. The 2007 FYR noted that a portion of the nitrate plume was beyond the capture zone of extraction well SEW-1. The 2007 review also noted those areas did not have shallow drinking water wells, and that the concentration levels were generally less than 30 mg/L at the time. The following year, in 2008, EPA signed Explanation of Significant Differences (ESD) #3, modifying the Northern Area remedy to allow MNA for the groundwater at the leading edge of the plume beyond the influence of extraction well SEW-1. The 2007 FYR did not specifically discuss the MW-36 "hot-spot" area, although MW-36 had nitrate concentrations ranging from an estimated high of 600 mg/L in 2005 to an estimated low of 300 mg/L in 2007.

Northern Area Groundwater Status During 2012 FYR

NARS Capture Area

As of late 2011, water quality trends for nitrate continued to decline during the five year period for all monitor wells within the capture zone of extraction well SEW-1, with the exception of monitor wells MW-08, MW-34, MW-35, and MW-36. The latter 3 wells are located upgradient of the Site along the San Pedro River in an area referred to as the nitrate "hot-spot." Increases in shallow aquifer well MW-08 appear to be due to its

proximity to extraction well SEW-1 and the circulation pattern caused by its cone of depression in proximity to the shallow aquifer boundary (see Figure 7).

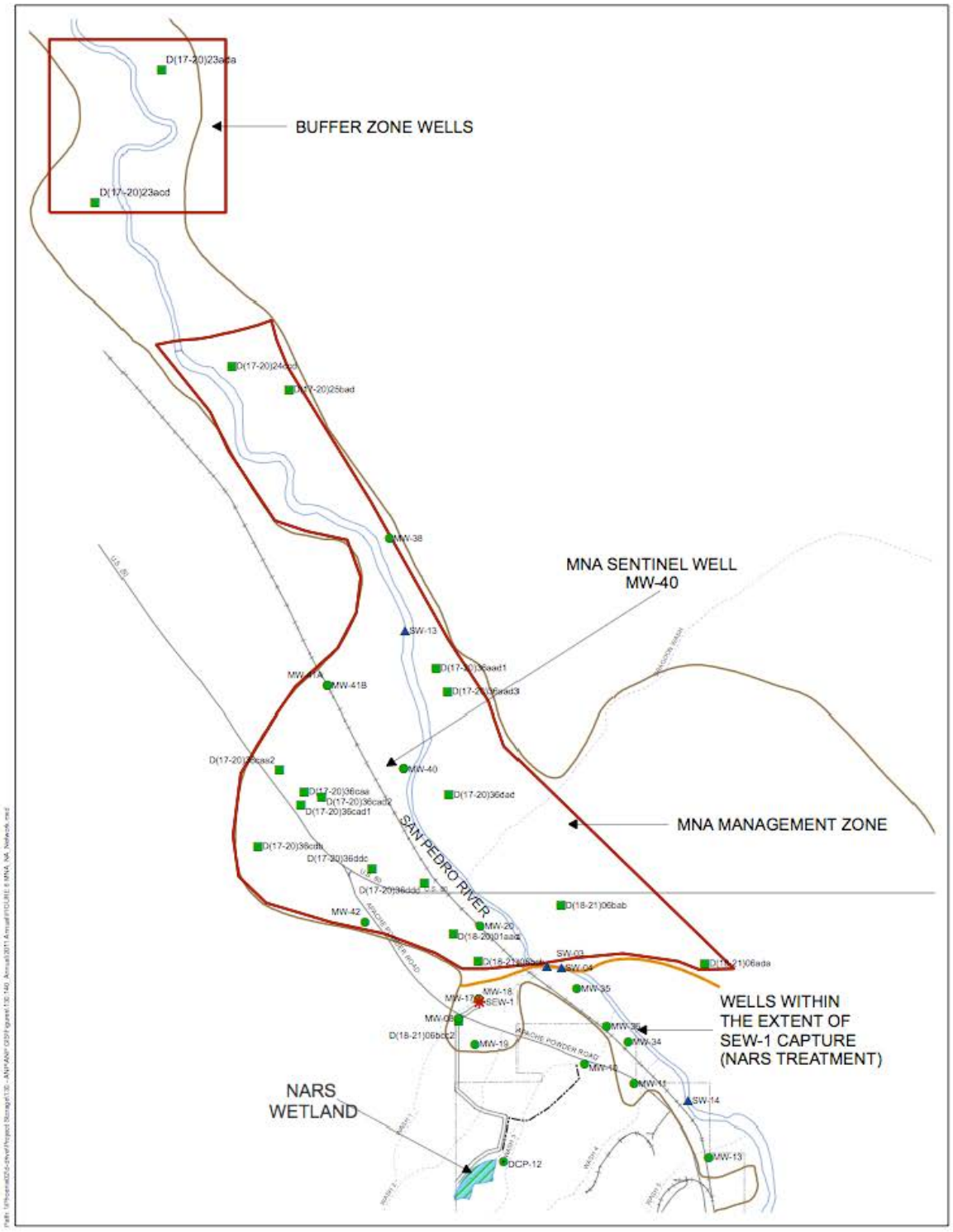


Figure 7. Northern Area Groundwater – Performance Monitoring Well Locations (Source: H+A, 2012b)

Nitrate concentrations in the "hot-spot" located quite a distance upgradient from the extraction well, SEW-1, show an inconsistent trend line. Nitrate concentrations at shallow aquifer monitoring well, MW-36, located at the "hot spot," were on a relatively steady decline between 2005 and November 2007, but then suddenly started to increase through August 2008 to 320 mg/L. During 2011 through early 2012, nitrate returned to a decreasing trend (towards the 200 mg/L range). The sudden increase in 2008 was interpreted as: (1) an indication of SEW-1 affecting gradients and concentrations at the MW-36 location as well as in areas upgradient, and (2) high concentrations lingering in some areas upgradient from MW-36, probably along the aquifer boundary, due to poor circulation and aquifer heterogeneities. A similar sharp increase also occurred at MW-34 (located upgradient of the "hot spot") between February 2009 and May 2010, with nitrate increasing from 0.67 mg/L to a high of 120 mg/L. The nitrate concentrations in MW-34 dropped back down to its original trend line in August 2010, and have remained there through February 2012. This unexpected increase in MW-34 appears to be due to the same factors as those contributing to the MW-36 increase. Seasonal pumping and recharge factors also may have contributed to these periodic increases.

In 2011 and again in 2012, EPA recommended that an additional monitoring well be installed on the west side of the San Pedro River northwest of MW-35 and west of SW-03 to better track residual nitrate contamination moving downgradient from the MW-36 area towards extraction well SEW-1. During the June 2012 technical meeting, EPA mentioned that EPA's comments had included this recommendation. ANPI and EPA agreed that this recommendation may be considered again in a few years depending on the nitrate trends in this area.

Northern MNA Area

In this Northern Area beyond the influence of extraction well SEW-1, the nitrate has continued its downward trend in all wells during the review period, with the exception of one shallow aquifer private well, D(18-21)06bc, which still has nitrate levels above the MCL as of November 2011. The monitoring wells in this northern area are a mixture of site monitoring wells and private shallow aquifer agricultural wells. During the period of 2006-2008, the following monitoring wells installed by ANPI dropped and stayed below the MCL for nitrate: MW-20, MW-38, MW-40 (with the exception of one exceedance in 2010), MW-41A, MW-41B, and MW-42. ANPI's 2011 Annual Report noted that typically a 3-5 year verification monitoring period is required to verify attainment of cleanup. Many of these shallow aquifer wells in the MNA management zone achieved this remediation goal by 2008.

SOUTHERN AREA GROUNDWATER

The Southern Area Groundwater remedy comprises three separate, but related, geographic areas now monitored by a limited number of wells because many wells in the original groundwater monitoring network for the Southern Area are now dry. The selected remedy for the Southern Area is MNA. The three areas and the monitoring wells still able to be monitored for water quality are:

- Perched Zone: P-01 and P-03; P-10 and MW-29 (these last two wells were checked to confirm they were dry).

- Molinos Creek Sub-Aquifer (MCA): MW-21, MW-23, MW-24, MW-39.
- Shallow Aquifer near San Pedro River: MW-14, MW-22, MW-25, MW-33.

The perched zone groundwater underlies the formerly active evaporation ponds located in the southern portion of ANP's primary operations area. These ponds historically received process wastewater or washdown waters containing nitrate and perchlorate from plant operations, resulting in contamination of the shallow aquifer groundwater in the Southern Area and the nearby MCA. Until the perched zone became significantly dewatered in recent years, the contaminated perched groundwater spilled over into the MCA. The shallow aquifer near the San Pedro River north of the perched zone and MCA continues to be monitored as a sentinel point and buffer zone.

Southern Area Groundwater Status During 2007 FYR

The data review section 6.2 of the 2007 FYR stated that "wells in the Southern Area predominantly display a decreasing trend in nitrate and perchlorate concentrations over the time of this five-year review …" However, this statement does not appear quite accurate. At the time of the 2007 FYR the wells that could be sampled in the perched zone and in the adjacent MCA showed stable or increasing water quality trends, as the water levels were dropping in these wells. See attached hydrographs for both the perched zone and MCA monitoring wells (Figures 9, 10, 12, 13 and 14). The perched zone was continuing to be dewatered by active extraction and evaporation and this dewatering also continued to lower the water levels in the MCA. The 2007 FYR selects one well, MW-21 in the MCA, as an example of a well that showed increases of nitrate and perchlorate, attributed to the lowered water levels in the MCA and the apparent "concentrating" effect on the well. The 2007 FYR states that the increasing trend in MW-21 had occurred in a relatively short time period making it difficult to establish the accuracy of the trend or the cause for the concentration increases. The 2007 FYR Report concludes that because the Southern Area groundwater is isolated from the San Pedro River and there are no private water supply wells in the aquifer, there is low potential for exposure to the contamination. However, continued monitoring of the nitrate and perchlorate concentrations was recommended, along with water levels, to possibly establish trends.

Southern Area Groundwater Status During 2012 FYR

During the data analysis of the perched zone and MCA monitoring wells for the 2012 FYR, the continuing downward decline of water levels in the remaining monitoring wells, combined with either generally stable or increasing groundwater quality trends for both nitrate and perchlorate is much clearer, with five additional years of data collection. The data indicate that the groundwater contaminants are increasing in concentration to a greater extent than observed in 2007 as the water levels continue to decline. The increasing trends are attributed to a "concentration stratification" effect with the contaminants of concern (COCs) concentrating at the bottom of the well screen because clean water was later discharged from the perched zone, which then migrated into the MCA and is layered on top of the more contaminated water. It is also noted that while the nitrate concentrations are increasing in the MCA, the perchlorate upward trend has

somewhat stabilized in recent years. Further monitoring will be needed to determine whether these trends will continue.

Perched Zone

Because the perched zone is a potential source of contaminated discharge into the MCA, there has been continued dewatering of this area through active pumping and continued monitoring of this area to ensure that this area is not recharged. The following perched zone monitoring wells have gone dry during the review period (2007-2012) and no longer can be sampled: P-10, MW-04, MW-29, MW-30, MW-31, and MW-32. Overall, since 1996 when the discharge of washdown waters into the evaporation ponds was ceased, the following other perched zone monitoring wells and piezometers have gone dry: P-02, P-04, P-05, P-06, P-07, P-08, P-09, P-11, and monitor wells MW-02 and MW-07. (See Figure 8)

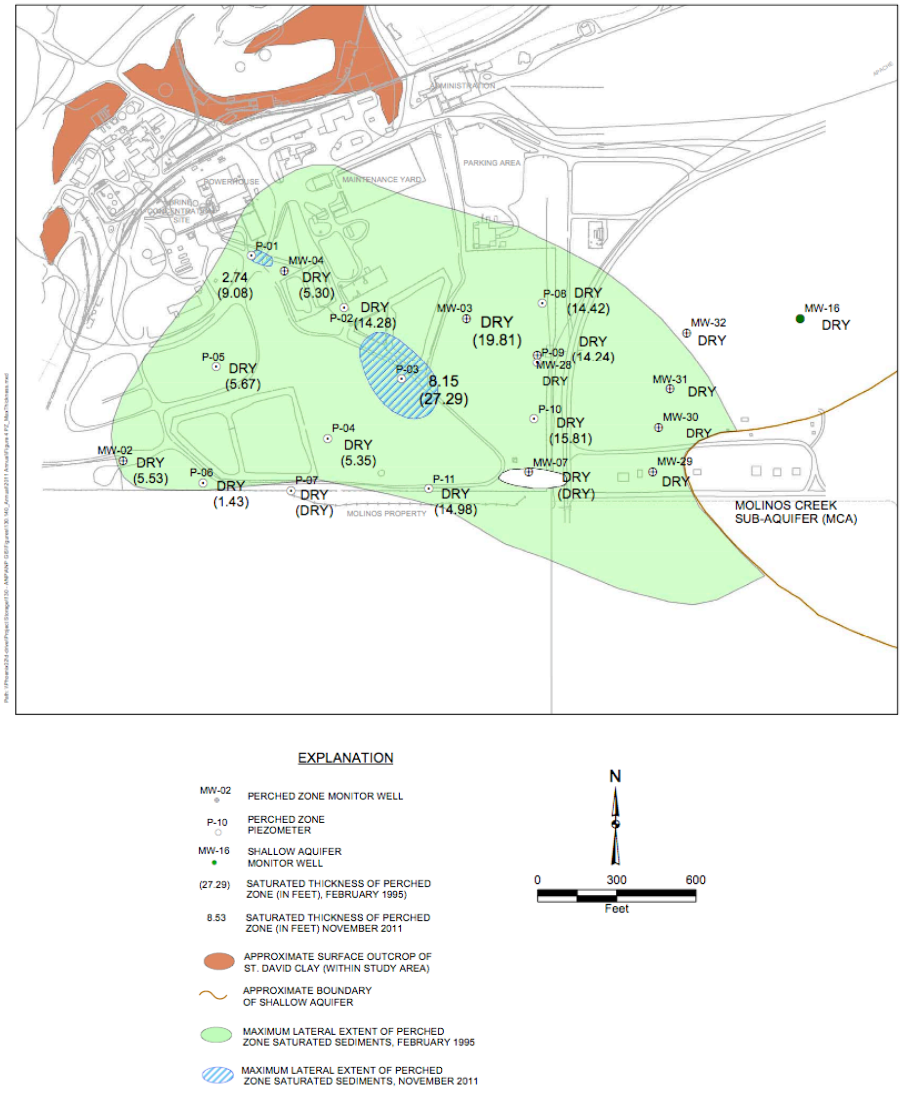


Figure 8. Location of Monitoring Wells in Perched Zone and Change in Areal Extent of Perched Zone (Source: H+A, 2012a)

The only two perched zone wells with sufficient water to be sampled for nitrate or perchlorate are P-01 and P-03. Two other monitoring points, MW-29 and P-10, are still monitored quarterly to confirm that they are dry and that there is no hydraulic connection between the perched zone and the MCA. The monitoring points are located in the subsurface drainage channel between the perched zone and the MCA (see Figure 11).

The concentrations of nitrate and perchlorate remaining in the perched zone are represented on the hydrographs for P-01 and P-03 (see Figures 9 and 10). The nitrate and perchlorate concentrations in P-01 generally declined to levels below the cleanup standards of 10 mg/l for nitrate and 14 ug/l for perchlorate by 2004, when water quality sampling ceased. However, in November 2011 and January 2012, when P-01 was resampled after 8 years, the nitrate concentrations were in the 150-180 mg/L range, and the perchlorate concentrations were in the 13-14 micrograms per liter (ug/L) range. In contrast, the perchlorate concentrations in P-03 during the same 12-year period ranged from 400 to 700 ug/L, and the nitrate concentrations have steadily increased during the same 12 years, from 2,000 mg/L to a high of almost 10,000 mg/L in January 2012.

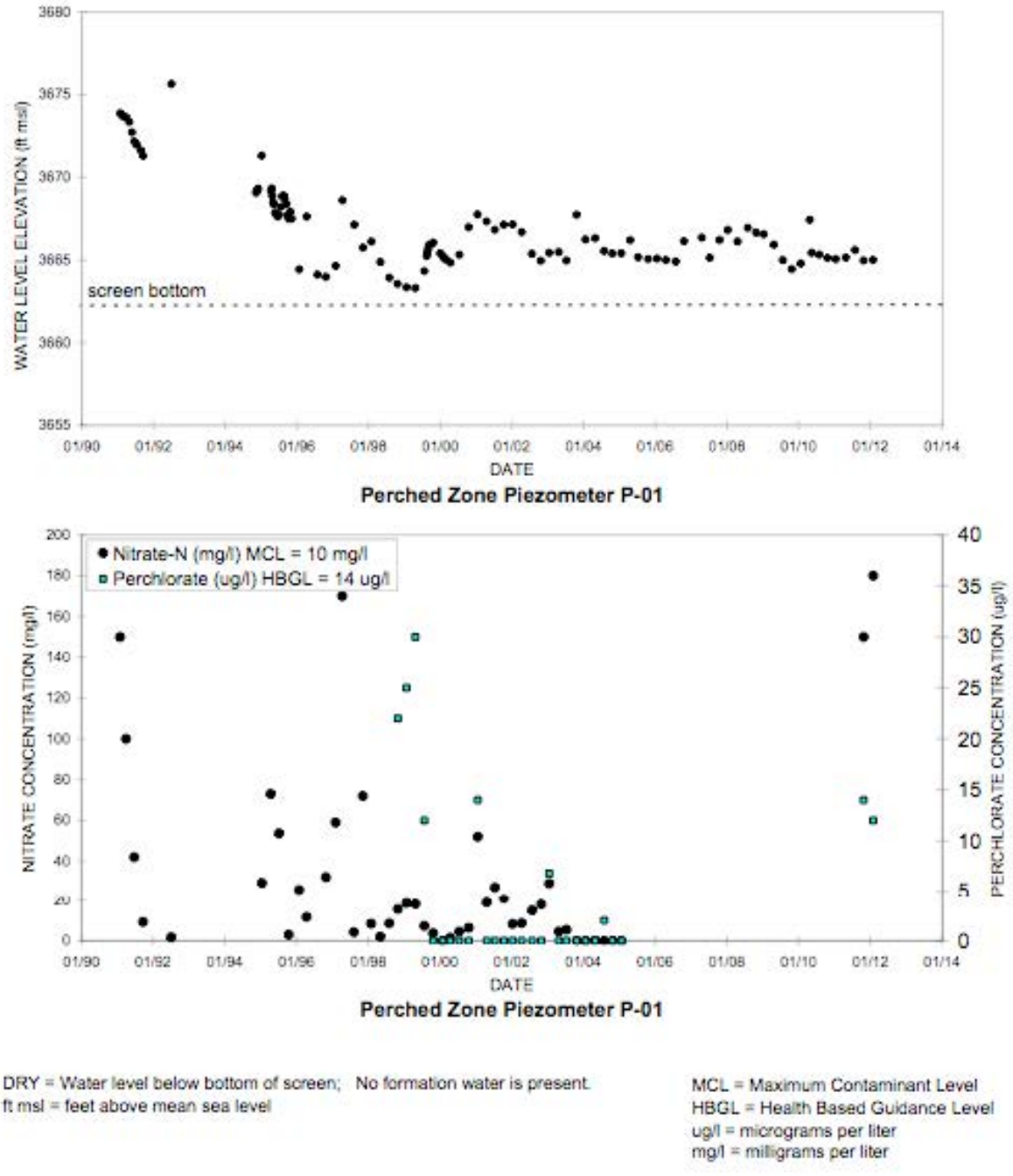
As previously discussed, the explanation for these increasing concentrations observed in the two remaining perched zone wells with minimal water remaining for sample collection has been identified as a form of "concentration stratification." This is defined as the process of high concentrations of nitrate and perchlorate concentrating at the bottom of the perched zone, as the quantity of water is reduced in the well while "clean" recharge water is layering on top. Therefore, as the water level declines, samples collected from increasing depths in the aquifer are more "concentrated."

Molinos Creek Sub-Aquifer (MCA)

The MCA is groundwater-bearing alluvium located in a hydraulically isolated paleochannel to the east and northeast of the perched zone and west of the San Pedro River shallow aquifer (see Figure 5). The MCA is believed to exist only as a result of historic discharges from the site. It was artificially created as a result of subsurface discharges into the MCA from the perched zone. Current water level data indicate that the water levels are declining in the MCA owing to a lack of artificial or natural recharge, as well as perhaps to current drought conditions in Arizona and evapo-transpiration loss. There is a flat hydraulic gradient across the MCA and there appears to be little, if any, lateral groundwater movement. This not only further indicates the hydraulic isolation of the MCA from the San Pedro River shallow aquifer, but also explains some of the water quality observations for the nitrate and perchlorate trends in this area.

In the current five year review period (2007 to 2012), there have been stable or upward trends in water quality concentrations for nitrate and perchlorate similar to those observed when the perched zone wells have gone dry. Only three of the five original monitoring wells are being used for monitoring the MCA as of June 2012. These wells are: MW-21, MW-23, and MW-39. In the intervening years, it has been determined that MW-24 (located at the northernmost point of the MCA) is hydraulically isolated

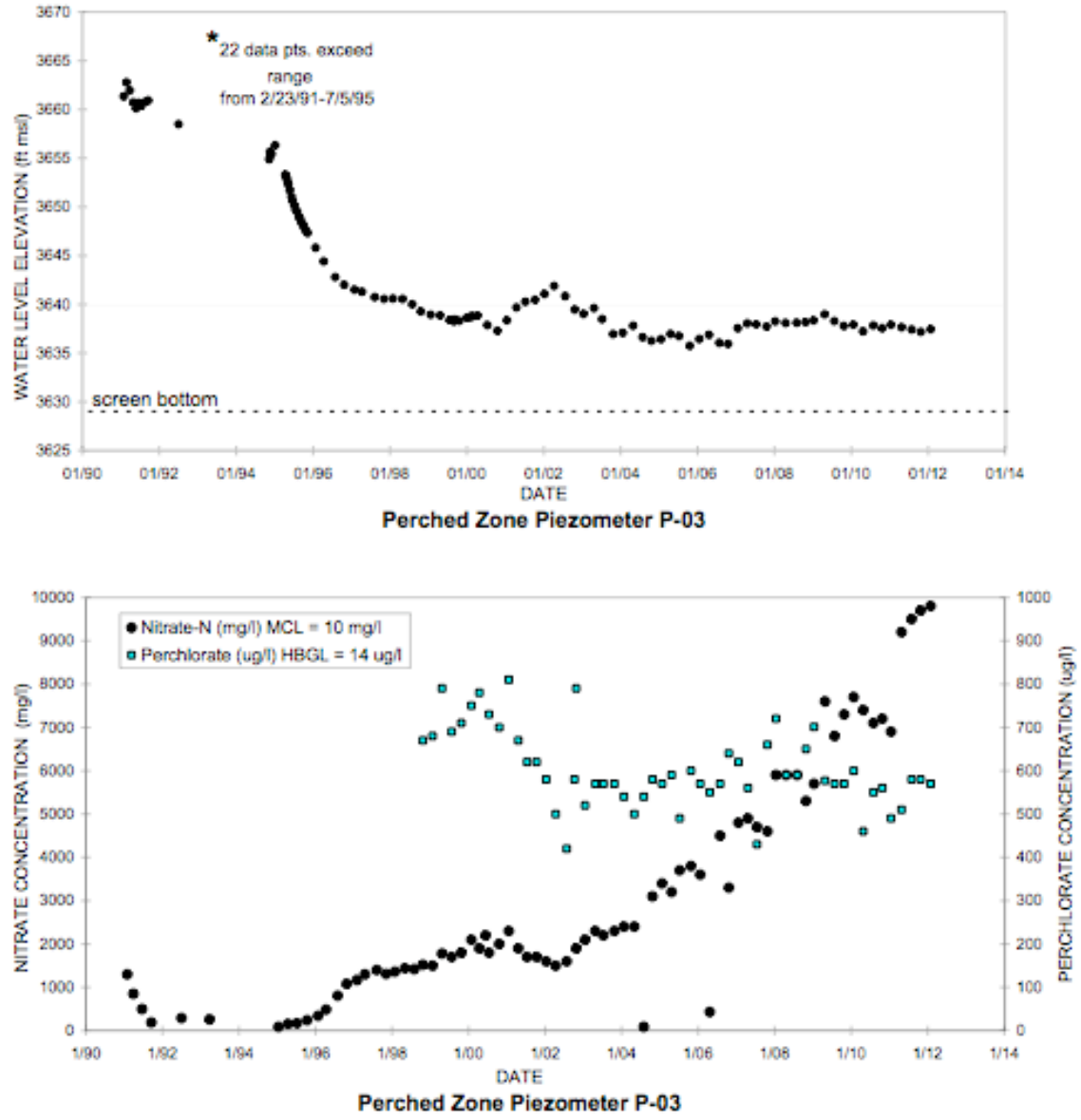
from the rest of the MCA (although MW-24 is still being monitored), and MW-15 has so little water remaining, due to declining water levels in the MCA, that it no longer can be sampled. (See Figure 11)



DRY = Water level below bottom of screen; No formation water is present.
ft msl = feet above mean sea level

MCL = Maximum Contaminant Level
HBGL = Health Based Guidance Level
ug/l = micrograms per liter
mg/l = milligrams per liter

Figure 9. Water Level and Water Quality Hydrographs for Perched Zone Piezometer P-01 (Source: H+A, 2012b).



DRY = Water level below bottom of screen; No formation water is present.
ft msl = feet above mean sea level

MCL = Maximum Contaminant Level
HBGL = Health Based Guidance Level
ug/l = micrograms per liter
mg/l = milligrams per liter

Figure 10. Source: Hargis + Associates. Water Level and Water Quality Hydrographs for Perched Zone Piezometer P-03. (Source: H+A, 2012b).

The concentrations of nitrate and perchlorate in these MCA monitoring wells have either remained stable or increased over the last five years. In MW-21, nitrate concentrations have increased from an estimated 500 mg/L in 2007 to a high of 3,700 mg/L in 2012, and perchlorate has increased from an estimated 100 ug/L in 2007 to a high of 300 ug/L in 2012 (see Figure 12). In MW-23, nitrate and perchlorate have stayed stable or decreased slightly. Nitrate in MW-23 has ranged from below the MCL until 2006 to a high of 20 mg/L in 2007, and most recently nitrate has hovered above and below the MCL, while perchlorate has ranged from a recent high of 60 ug/L in 2008 to more recent concentrations in the 20 ug/L range as of 2010-2012 (see Figure 13). MW-39 is similar to MW-23, with the nitrate and perchlorate concentrations remaining relatively stable but elevated. During the period of 2008-2012, the nitrate concentrations in MW-39 ranged from 75 to 150 mg/L, with the exception of 290 mg/L detected in 2008; and perchlorate remained relatively stable in the 100 ug/L range, with the exception of approximately 250 ug/L detected in 2008 (see Figure 14).

During the June 2012 annual technical meeting with ANPI, EPA continued ongoing discussions with ANPI regarding the fact that there appear to be no reliable downward trends occurring in the MCA. Instead, the three remaining MCA monitoring wells are behaving similarly to the perched zone wells (i.e., they are exhibiting the same "stratification" characteristics in which the concentrations are rising to levels significantly above the cleanup levels, as the water levels are declining in the MCA). Most likely due to the stagnant conditions of the MCA, the concentrations in some wells are staying stable but elevated at levels above the cleanup standards. The current MCA trends are not exhibiting the characteristics expected from an MNA remedy. ANPI has recognized this issue and is now proceeding to develop a proposal for an in situ pilot study in the MCA to determine if in situ bioremediation could be effective in the MCA or perched zone in meeting the cleanup standards for the Southern Area.

Shallow Aquifer Near San Pedro River

The Southern Area Monitored Natural Attenuation (MNA) performance monitoring network also includes the following six monitoring wells: MW-01, MW-06, MW-14, MW-22, MW-25, and MW-33 (see Figure 11). The purpose of these wells is to complete the MNA management zone monitoring network. Of these six wells, two (MW-01 and MW-06) are upgradient monitor wells located south of the site for establishing background conditions. MW-14 and MW-22 are classified as sentinel wells to monitor whether the plume boundary in the MCA has advanced. The remaining wells (MW-25, MW-33) are classified as buffer zone wells to estimate the anticipated maximum distance the contamination could migrate if not detected by the sentinel wells (See Figure 11).

The water in all these wells has been non-detect for perchlorate since monitoring of the Site was initiated. Perchlorate has been detected only in the perched zone and MCA. Regarding nitrate, during the current FYR period, these shallow aquifer monitoring wells located along the San Pedro River quite a distant downgradient from the MCA and the perched zone have not been observed to have nitrate concentrations of any significance. The nitrate concentrations have been either at levels below the detection limit of 1 mg/L or at very low levels (2-4 mg/L), well below the MCL of 10 mg/L.

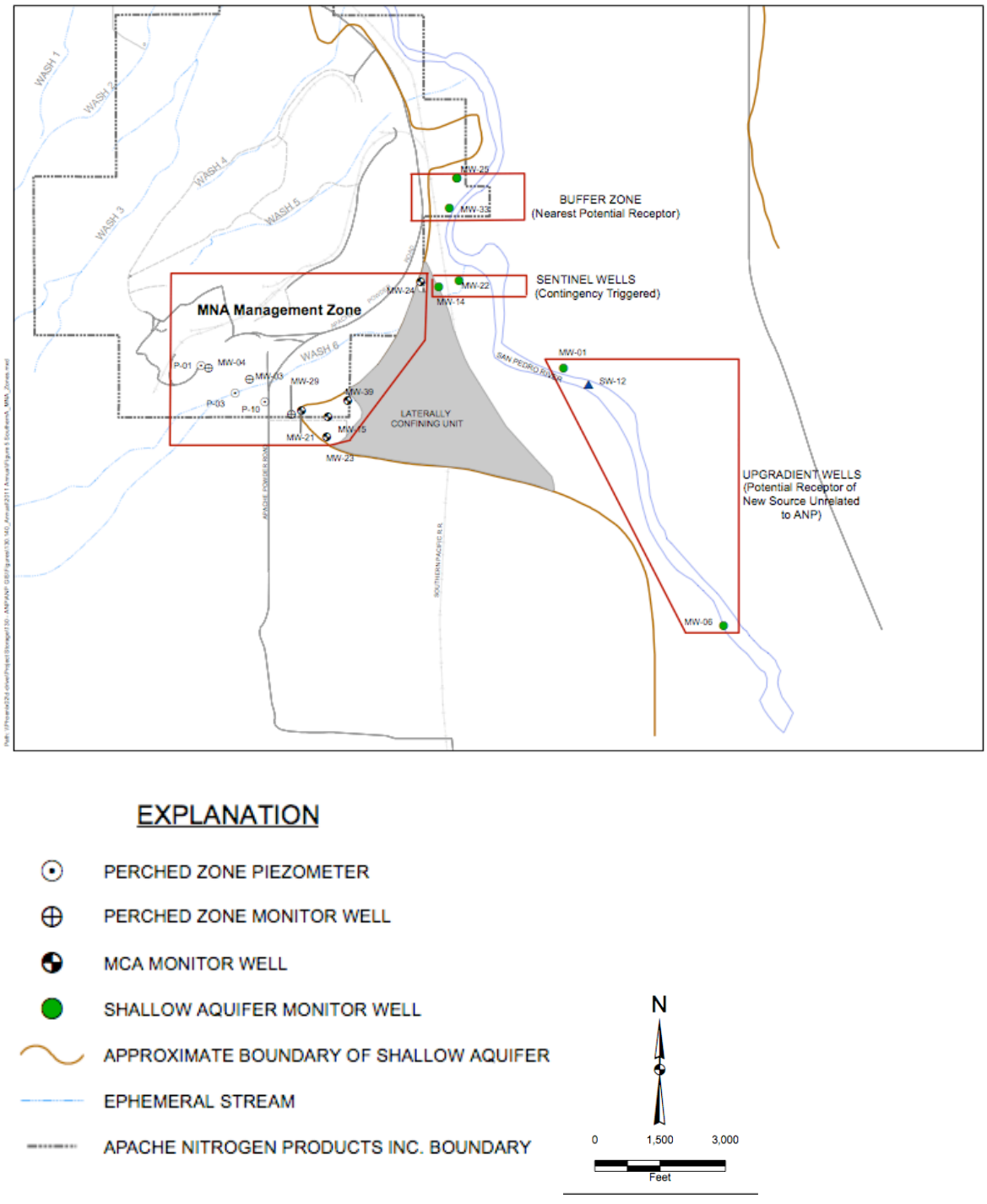
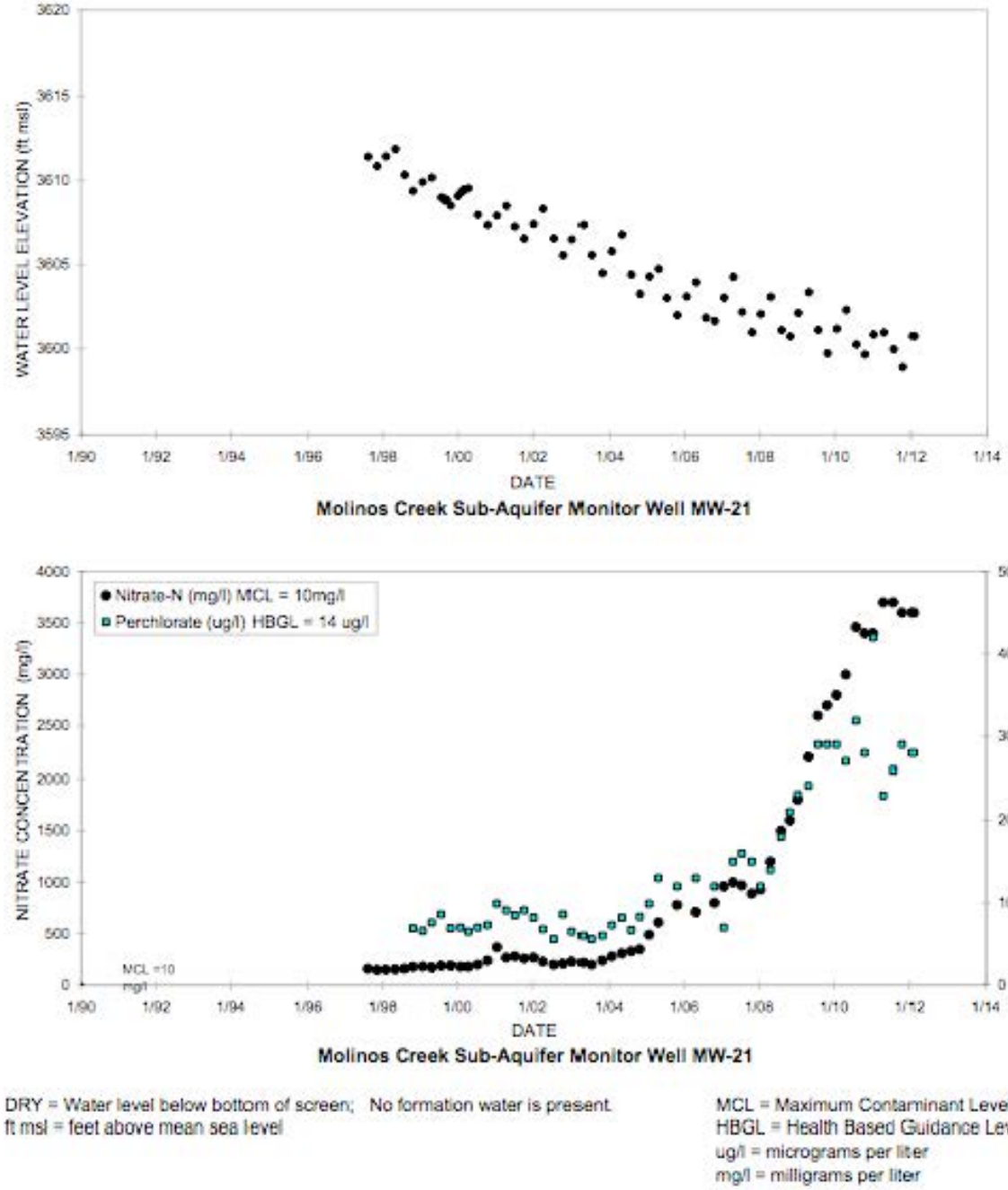


Figure 11. Map of Southern Area Groundwater Performance Monitoring Network. (Source: H+A, 2007b).



DRY = Water level below bottom of screen; No formation water is present.
ft msl = feet above mean sea level

MCL = Maximum Contaminant Level
HBGL = Health Based Guidance Level
ug/l = micrograms per liter
mg/l = milligrams per liter

Figure 12 Water Level and Water Quality Hydrographs for Molinos Creek MNA Management Zone Monitor Well MW-21. (Source: H+A, 2012b)

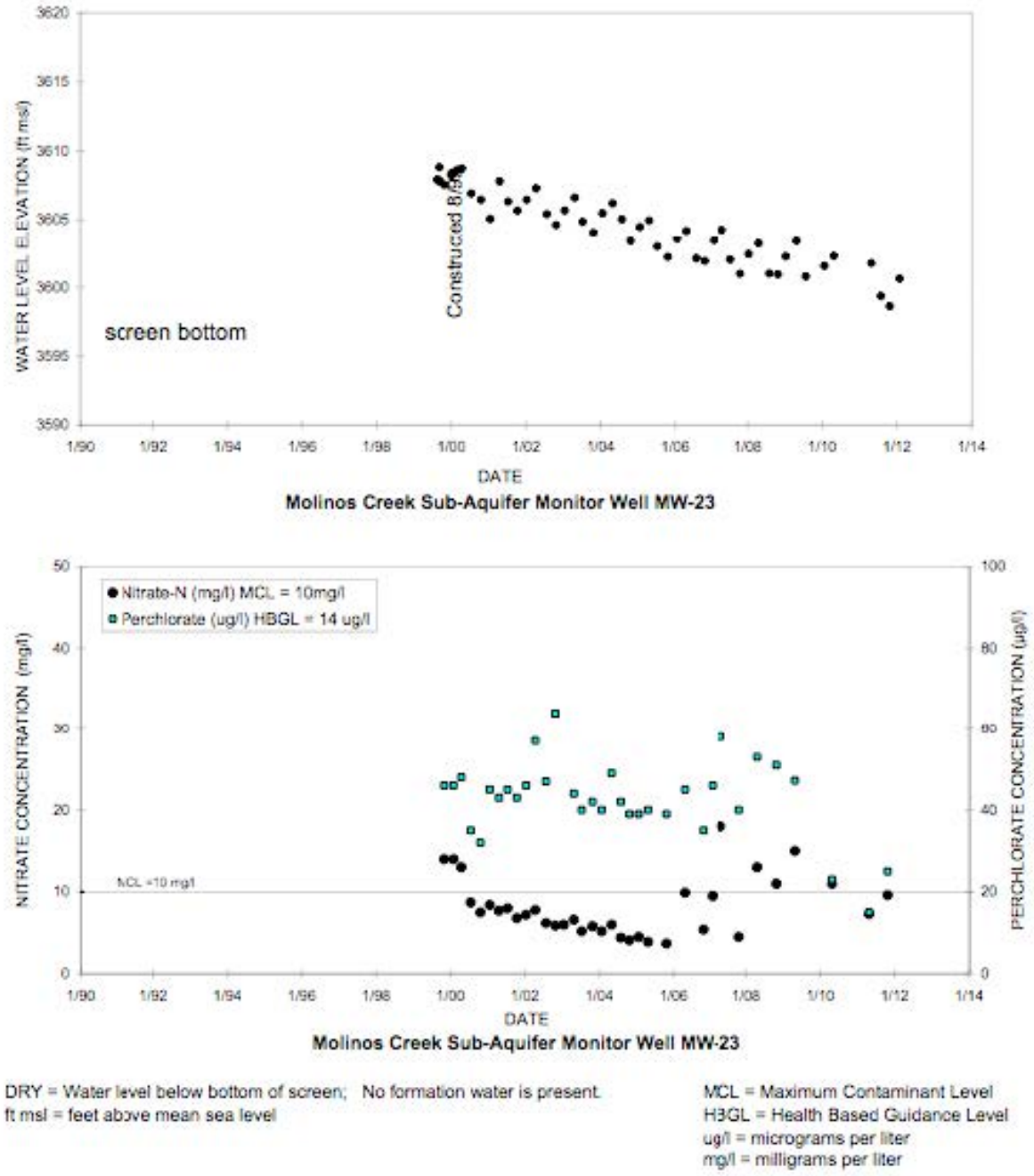


Figure 13. Water Level and Water Quality Hydrographs for Molinos Creek MNA Management Zone Monitor Well MW-23. (Source: H+A, 2012b)

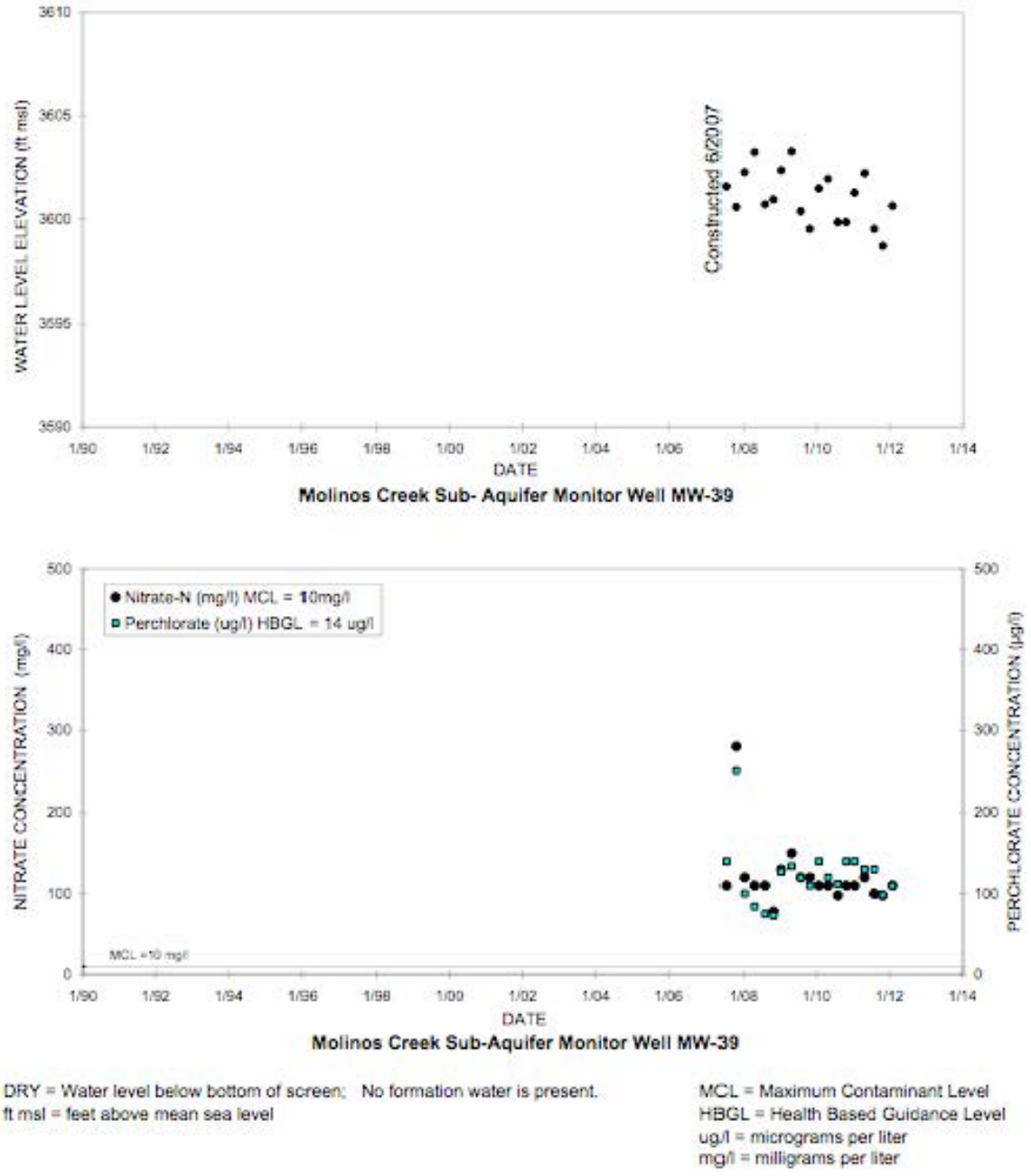


Figure 14. Water Level and Water Quality Hydrographs for Molinos Creek MNA Management Zone Monitor Well MW-39. (Source: H+A, 2012b)

CONCLUSIONS AND RECOMMENDATIONS

NORTHERN AREA GROUNDWATER

The groundwater remedy in the Northern Area has been performing as predicted, if not better than predicted, during the 2007-2012 FYR period. The Northern Area Remediation System (NARS) has been extremely effective in removing the nitrate 24/7, 365 days a year, with the exception of two short intervals during 2010 and 2011, when unexpected cold spells dropped the water temperature and the alternate discharge point needed to be used for short periods of time. The alternative discharge point was established in 1997 when the NARS was designed to provide a point for temporarily discharging effluent that did not meet the discharge treatment standards until EPA-approved modifications could be made to the wetlands treatment system operations. Examples of these modifications may include increased dosage of molasses, reduced pumping rates of the extraction well or increased residency time in the treatment ponds. Action is now being taken by ANPI to include in the O&M Manual a protocol for more carefully tracking temperature changes during the winter months, so that interventions such as slowing down the pumping rate or adding molasses (actions taken during these two events) can be taken in advance rather than after the effluent discharge concentrations are observed to be rising above the MCL.

Performance Criteria

The 1994 ROD established groundwater cleanup standard for nitrate, and the 2005 ROD Amendment established a groundwater cleanup standard for perchlorate. The primary performance criteria for the Northern Area Groundwater are the cleanup standards. In addition, the 2008 Northern Area Performance Monitoring Plan established performance standards for the Monitored Natural Attenuation (MNA) remedy selected for the leading (distal) edge of the plume in the Northern Area where nitrate contamination migrated beyond the influence of the extraction well SEW-1 and the capture zone for the NARS.

The MNA remedy for the Northern Area groundwater at the Site requires performance monitoring and evaluation to assure that the remedy is progressing toward cleanup standards at an acceptable rate. A program for the evaluation of remedy performance has been outlined within this document. The key elements of the performance monitoring and evaluation include:

- Evaluation of groundwater nitrate-N reduction in the Northern Area shallow aquifer MNA management zone on an annual basis according to method outlined.
- Verification of containment of the nitrate-N concentrations within their presently known extent of SEW-1 capture area. This includes maintaining continued performance of the NARS.
- Evaluation if the Site data trends fit the conceptual model.
- Overall evaluation of performance based on a moving five-year trend. This is directed at projecting the ultimate timeframe for cleanup.
- Monitoring water levels and water quality as outlined.

- Evaluation of institutional controls.
- Annual reporting of performance to EPA and other agencies.

2012 Northern Area Groundwater Findings

Extraction well SEW-1 and the extraction system are functioning as designed and are effectively capturing the remaining nitrate in the Northern Area. All the wells in the Northern MNA area, with the exception of one private shallow aquifer agricultural well, are now below the MCL for nitrate. In the immediate vicinity of the NARS and SEW-1, the nitrate concentrations have again continued to decline to levels close to the cleanup standard. The one area with elevated nitrate concentrations is the MW-36 "hot-spot" area, although the nitrate concentrations in this area have decreased by a third from the concentrations detected during the last FYR (from approximately 320 mg/L in 2007 to 200 mg/L in 2012). The evaluation of the data trends fit the conceptual model. The Institutional Controls, the Alternate Water Supply Plan and an annual Well Inventory Update, have been implemented to ensure that no households within the vicinity of the nitrate-contaminated shallow aquifer groundwater are exposed to contaminated drinking water.

In summary these key findings are:

- NARS capture appears to be controlling further spreading of nitrate to north.
- MNA appears to have reduced the plume north of NARS capture zone.
- Institutional Controls are in place.
- Alternate Domestic Water Supply Program remains active.
- Well Inventory is updated annually.

2012 Northern Area Groundwater Recommendations

The following recommendations are made in this 2012 FYR for the Northern Area Groundwater:

- In-situ treatment could potentially reduce nitrate concentrations in vicinity of MW-36. The in-situ treatability study planned for the MCA should be evaluated upon completion to determine if similar enhancements could accelerate cleanup in the Northern Area.
- A new monitoring well located east of SEW-1 on the west side of the San Pedro River, north of MW-36, may be helpful to monitor transport of residual contamination from the vicinity of MW-36 at the base of Wash 3. (This new proposed well is separate from the well previously proposed for installation on the east side of the San Pedro River.)

SOUTHERN AREA GROUNDWATER

The groundwater remedy in the Southern Area is not showing the downward contaminant trends that are observed in the Northern Area. The perched zone monitoring wells with sufficient water remaining to be sampled (P-01 and P-03) either have nitrate and perchlorate concentrations that are remaining stable or significantly above the cleanup standards and continue to show signs of "concentration stratification," as previously discussed. This same observation can be made for MCA well MW-21.

The other two MCA wells (MW-23, and MW-39), which have sufficient water to be sampled, are remaining reasonably stable, but in the case of MW-39 at concentrations exceeding the cleanup standards. Of the numerous monitoring wells installed in these two contaminated areas over the last 20 years, all but two perched zone piezometers and three MCA wells are dry. The other 6 Southern Area monitoring wells are downgradient sentinel or buffer zone wells and upgradient wells located outside of the area of hydraulically contained nitrate and perchlorate contamination.

Performance Criteria

The 2007 Performance Monitoring Plan for the Southern Area states that the MNA remedy for Southern Area groundwater at the Site requires performance monitoring and evaluation to assure that the remedy is progressing toward cleanup standards at an acceptable rate. The key elements of the performance monitoring and evaluation include:

- Evaluation of groundwater volume reduction and COC mass reduction in the MCA on an annual basis according to methods outlined.
- Overall evaluation of performance based on a moving five-year trend. This is directed at projecting the ultimate timeframe for cleanup.
- Verification of containment of the COCs within their presently known area(s). This includes maintaining the existing degree of hydraulic separation between the perched zone and MCA.
- Annual reporting of performance to EPA and other agencies. (H+A, 2007b)

In 2007, the Performance Monitoring Plan for the Southern Area concluded that insufficient data existed to determine rates and trends of volume and mass reduction appropriate for rigorous assessment of remedy performance acceptability; however, preliminary trends based on application of historical data support the appropriateness of this methodology.

On the basis of a five-year review interval, decisions on the acceptability of remedy performance will be made. If the five-year review indicates unfavorable performance, consideration will be given to the need to consider implementation of a contingent or supplemental remedy. The primary criteria to be considered in regard to a determination of unfavorable remedy performance would include, but not necessarily be limited to

- Unfavorable water quality trends,
- New sources or releases, and
- New health risk factors.

2012 Southern Area Groundwater Findings

Based on the data review and the criteria of decreasing water quality trends, the MNA cleanup remedy does not appear to be progressing at the rate originally projected.

- MNA does not appear to be reducing concentrations of perchlorate and nitrate.
- Criteria for determining reduction of contaminant mass have not been able to be measured, due to increasing contaminant trends.

However the remedy, including the dewatering efforts, have proven effective in the following areas:

- Perchlorate and nitrate-contamination are hydraulically contained and captured.
- Water levels continue to drop in the MCA and to a lesser extent in the perched zone.
- Hydraulic separation between the perched zone and MCA has been maintained.

Some type of enhancement to this MNA remedy may be necessary to meet cleanup standards within a reasonable timeframe. ANPI has developed a preliminary proposal for an in situ pilot study test in the Southern Area. If any unexpected problems should occur during the pilot study (i.e., clogged wells, new contaminants of potential concern identified), any potential damage would be limited to a small geographic area. ANPI plans to submit more developed pilot study proposal for Agency review during the next few months. As a backup alternative, some type of submergent wetlands system or a renewed look at the feasibility of treating the perchlorate- and nitrate-contaminated groundwater in an open wetlands system may also be options for enhancing treatment in the Southern Area.

A second issue regarding the adequacy of the existing monitoring network within the MCA for monitoring either an in situ pilot study or proving the Southern Area has met cleanup standards also has been raised with ANPI. While the goal for the perched system has been to dewater it completely, this may not be a feasible goal for the MCA. With only three monitoring wells remaining in the MCA, there may not be sufficient monitoring coverage to make a closeout determination. Also, it is not clear whether there are sufficient monitoring wells for conducting an in situ pilot study in the MCA. These issues will need to be revisited when the in situ pilot treatability study proposal is submitted for Agency review.

2012 Southern Area Groundwater Recommendations

The following recommendations are made in this 2012 FYR for the Southern Area Groundwater:

- Additional monitoring wells may be needed in the MCA of the Southern Area.
- Recommend in-situ pilot study to see if biodegradation will reduce levels in MCA.

REFERENCES

Hargis + Associates, Comprehensive Northern Area Characterization Workplan, Apache Powder Superfund (2006) Site, Cochise County, Arizona, August 21, 2006.

Hargis + Associates (2007a), Southern Area Characterization Report, Apache Powder Superfund Site, Cochise County, Arizona, March 27, 2007.

Hargis + Associates (2007b), Southern Area Performance Monitoring Plan, Revision 2.0, Apache Powder Superfund Site, Cochise County, Arizona, September 19, 2007.

Hargis + Associates (2008a), Soils Engineering Control Plan, Apache Powder Superfund Site, Cochise County, Arizona, April 22, 2008.

Hargis + Associates (2008b), Northern Area Monitored Natural Attenuation Assessment, Revision 1.0, Apache Powder Superfund Site, Cochise County, Arizona, July 14, 2008.

Hargis + Associates (2009), Performance Monitoring Plan for Monitored Natural Attenuation of Shallow Aquifer Groundwater in the Northern Area of the Apache Powder Superfund Site, Revision 1.0, Apache Powder Superfund Site, Cochise County, Arizona, February 12, 2009.

Hargis + Associates (2012a), 2011 Annual Performance Monitoring and Site-Wide Status Report, Revision 1.0, Apache Powder Superfund Site, Cochise County, Arizona, August 13, 2012.

Hargis + Associates (2012b), Summary of Quarterly Performance Monitoring for Northern and Southern Areas, February 2012, Apache Powder Superfund Site, May 18, 2012.

Hargis + Associates (2012c), E-Mail Communication from L. Leonhart, Ph.D., Hargis, to A. Benner, EPA, regarding Conceptual Site Model, dated July 3, 2012.

U.S. Environmental Protection Agency (2007), Interim Remedial Action Report for the Southern Area Groundwater, Apache Powder Superfund Site, Cochise County, Arizona, September 27, 2007.

U.S. Environmental Protection Agency (2008), Interim Remedial Action Report for the Northern Area Groundwater, Apache Powder Superfund Site, Cochise County, Arizona, September 25, 2008.

Apache Powder Superfund Site
Third Five-Year Report

Appendix B
List of Documents Reviewed for FYR Report

Documents Reviewed for Apache Superfund Site
2012 Third Five Year Review

Hargis + Associates Documents

2007-03-09 Operation and Maintenance Plan, Northern Area Remediation System, Revision 3.0

2007-03-20 2006 Annual Summary of Groundwater and Surface Water Monitoring Program

2007-06-25 Summary of Quarterly Groundwater and Surface Water Monitoring Program, February 2007

2007-08-10 Summary of Quarterly Groundwater and Surface Water Monitoring Program, May 2007

2007-09-05 Southern Area Performance Monitoring Plan, Revision 1.0

2007-09-11 2007 Well Inventory Update

2007-10-16 Alternate Domestic Water Supply Plan, Revision 2.0

2007-10-17 Community Outreach Plan

2008-01-29 EPA Site Inspection Report RA Complete

2008-02-14 Summary of Quarterly Groundwater and Surface Water Monitoring Program, November 2007

2008-03-20 2007 Annual Summary of Groundwater and Surface Water Monitoring Program

2008-04-22 Remedial Action (RA) Implementation Report for Pond Soils and Sediments (CERCLA Media Component 3 and Formerly Active Ponds), Revision 1.0

2008-06-17 Summary of Quarterly Groundwater and Surface Water Monitoring Program, February 2008

2008-07-14 Northern Area Monitored Natural Attenuation (MNA) Assessment, Revision 1.0

2008-07-18 Long-Term Site-Wide Remedies Performance Monitoring and Operations and Maintenance (O&M)

2009-01-06 2008 Annual Pond Cover Inspection Report

2009-02-09 Summary of Quarterly Performance Monitoring for Northern and Southern Areas, November 2008

2009-02-12 Performance Monitoring Plan for Monitored Natural Attenuation (MNA) of Shallow Aquifer Groundwater in the Northern Area, Rev. 1.0

2009-02-12 Alternate Domestic Water Supply Plan, Revision 3.0

2009-03-30 2008 Annual Annual Performance Monitoring and Side-Wide Status Report, Revision 1.0

2009-07-13 Summary of Quarterly Performance Monitoring for Northern and Southern Areas, February 2009

2009-11-05 Summary of Quarterly Performance Monitoring for Northern and Southern Areas, May 2009

2009-12-04 2009 Well Inventory Update

2009-12-23 Summary of Quarterly Performance Monitoring for Northern and Southern Areas, August 2009

2010-01-05 2009 Annual Pond Cover Inspection Report

2010-02-08 Summary of Quarterly Performance Monitoring for Northern and Southern Areas, November 2009

2010-05-07 Summary of Quarterly Performance Monitoring for Northern and Southern Areas, February 2010

2010-06-14 Quality Assurance Project Plan (QAPP), Performance Monitoring and Operation and Maintenance of Remedies, Revision 1.0

2010-06-28 2009 Annual Performance Monitoring and Side-Wide Status Report

2010-08-10 Summary of Quarterly Performance Monitoring for Northern and Southern Areas, May 2010

2010-10-21 2010 Well Inventory Update

2010-12-02 Summary of Quarterly Performance Monitoring for Northern and Southern Areas, August 2010

2011-01-06 2010 Annual Pond Cover Inspection Report

2011-03-29 2010 Annual Performance Monitoring and Side-Wide Status Report

2011-05-17 Summary of Quarterly Performance Monitoring for Northern and Southern Areas, February 2011

2011-08-12 Revised Quarterly Performance Monitoring for Northern and Southern Areas, February 2011

2011-08-12 Summary of Quarterly Performance Monitoring for Northern and Southern Areas, May 2011

2011-10-24 2011 Well Inventory Update

2011-11-04 Summary of Quarterly Performance Monitoring for Northern and Southern Areas, August 2011

2012-01-12 2012 Annual Pond Cover Inspection Report

2012-02-17 Summary of Quarterly Performance Monitoring for Northern and Southern Areas, November 2011

2012-03-29 2011 Annual Performance Monitoring and Site-Wide Status Report

U.S. Environmental Protection Agency (EPA) Documents

1994-09-30 Record of Decision (ROD), Apache Powder Superfund Site

1997-04-16 Explanation of Significant Difference (ESD) #1

2000-09-29 Explanation of Significant Difference (ESD) #2

2002-09 First Five Year Review Report

2005-09-30 Amendment to the ROD, Apache Powder Superfund Site

2007-09 Technical Analysis 2002-2007 for Five Year Review (Army Corps)

2007-09-25 Second Five Year Review Report

2007-09-26 Site Inspection Report for Completion of Southern Area Groundwater Remedy (CH2M Hill)

2007-09-27 Interim Remedial Action Report for Southern Area Groundwater

2008-01-29 Site Inspection Report for Completion of Soils Remedy (CH2M Hill)

2008-07-02 Site Inspection Report for Completion of Northern Area Groundwater Remedy (CH2M Hill)

2008-07-31 Explanation of Significant Difference (ESD) #3

2008-09-25 Interim Remedial Action Report for Northern Area Groundwater

2008-09-25 Final Remedial Action Report for Contaminated Soils

2008-09-28 Preliminary Close Out Report

Other Documents

2008-08-22 Declaration of Environmental Use Restriction (DEUR)

Apache Powder Superfund Site
Third Five-Year Report

Appendix C
Site Inspection Report

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Apache Powder	**Date of inspection:** June 12, 2012
Location and Region: St David, AZ (EPA Region 9)	**EPA ID:** AZD008399263
Agency, office, or company leading the five-year review: EPA San Francisco Region 9	**Weather/temperature:** Sunny, 98 º F

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other Groundwater source control MNA
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Craig Boudle Safety-Health & Environmental Manager June 12, 2012
   Name Title Date
   Interviewed: ☒ at Site ☒ at office ☒ by phone Phone no. 520-720-2114
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Jeff Bauer EHS Manager June 12, 2012
   Name Title Date
   Interviewed: ☒ at Site ☒ at office ☐ by phone Phone no. 520-720-2177
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ADEQ____
Contact ___Robert Wallin_____ Project Manager June 12, 2012 520-628-6743_
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☒ O&M manual — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☐ As-built drawings — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☒ Maintenance logs — ☒ Readily available — ☒ Up to date — ☐ N/A

   Remarks: Wetlands documented weekly; ponds documented thru e-mail & hard copy. All documents maintained/tracked using Tab Ware Database and kept on hard drive.

2. **Site-Specific Health and Safety Plan** — ☒ Readily available — ☒ Up to date — ☐ N/A
   ☐ Contingency plan/emergency response plan — ☐ Readily available — ☐ Up to date — ☒ N/A
   Remarks

3. **O&M and OSHA Training Records** — ☒ Readily available — ☒ Up to date — ☐ N/A
   Remarks

4. **Permits and Service Agreements**
   - ☒ Air discharge permit — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☒ Effluent discharge — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☒ Waste disposal, POTW — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☐ Other permits _____ — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks: All appropriate documents are in files and readily available; air discharge permit is also posted. Apache is classified as an exempt small quantity generator.

5. **Gas Generation Records** — ☒ Readily available — ☒ Up to date — ☐ N/A
   Remarks

6. **Settlement Monument Records** — ☒ Readily available — ☒ Up to date — ☐ N/A
   Remarks Apache Cost Recovery Settlement with EPA December 2009

7. **Groundwater Monitoring Records** — ☒ Readily available — ☒ Up to date — ☐ N/A
   Remarks

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — ☒ N/A
   Remarks

9. **Discharge Compliance Records**
   - ☒ Air — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☒ Water (effluent) — ☒ Readily available — ☒ Up to date — ☐ N/A

   Remarks Air records are provided to ADEQ quarterly. Wetlands reporting and treatment logs maintained and up to date.

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — ☒ N/A
    Remarks

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☒ Other EPA has a copy of the O&M Organization.

2. **O&M Cost Records**

☒ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ANPI has provided EPA O&M cost information needed for the FYR.
☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: All cost information has been provided to EPA.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on Site map ☒ Gates secured ☐ N/A

Remarks Fencing is in good condition (approximately 2 years old). Fencing is high-security around operations area of ANPI facility. The Wetlands treatment area is fenced for traffic. *(See Photo Nos. 1 and 2)*

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on Site map ☐ N/A

Remarks Signage is in good condition and placed appropriately throughout facility including at former evaporation ponds. *(See Photo Nos. 3 and 4)*

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) __self-reporting___

Frequency ___Every 90 days__

Responsible party/agency __Apache Powder

Contact _____Jeff Bauer EHS Manager _ 520-720-2177___

Name Title Date Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☒Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A

Other problems or suggestions: ☐ Report attached

_Formerly active ponds are capped with two feet of native soil .There is a Declaration of Environmental Use Restriction (DEUR) on the formerly active ponds. ANPI's contractor Hargis + Associates prepares an annual Pond Cover Report after inspecting ponds for compliance with the DEUR's engineering controls requirements.

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on Site map ☒ No vandalism evident

Remarks: _No vandalism. Trespassers have been arrested via Border Patrol outside the internal operational fencing on one occasion during the last few years.

2. **Land use changes on Site** ☐ N/A

Remarks __Improvements to the stormwater drainage system, including cutting new swales along roadsides.

3. **Land use changes off Site** ☐ N/A

Remarks _Nothing significant near the facility.

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on Site map ☒ Roads adequate ☐ N/A

Remarks

B. Other Site Conditions

Remarks: None

VII. EVAPORATIVE POND COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on Site map ☒ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** ☐ Location shown on Site map ☒ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** ☐ Location shown on Site map ☒ Erosion not evident
   Areal extent_____ Depth_____
   Remarks Pond covers are in good condition with no visible erosion (*See photo No. 5)* Wattles are used to prevent erosion on the pond covers. As wattles began to deteriorate, a new one is placed on top of the old one and they are staked together for maximum erosion control. *(See Photo No.6)*

4. **Holes** ☐ Location shown on Site map ☒ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** ☒ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks Native vegetation including some native shrubs and /trees taking hold (*See Photo Nos. 7 and 8)*

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
   Remarks_____

7. **Bulges** ☐ Location shown on Site map ☒ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on Site map Areal extent_____
   ☐ Ponding ☐ Location shown on Site map Areal extent_____
   ☐ Seeps ☐ Location shown on Site map Areal extent_____
   ☐ Soft subgrade ☐ Location shown on Site map Areal extent_____
   Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on Site map ☒ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on Site map ☒ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on Site map ☒ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on Site map ☒ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☒ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on Site map ☒ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on Site map ☒ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on Site map ☒ No evidence of erosion
Areal extent_____ Depth_____
Remarks _(*See Photo Nos.* 5 and 6)._____

4. **Undercutting** ☐ Location shown on Site map ☒ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☒ No obstructions
☐ Location shown on Site map Areal extent_____ Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____

☒ No evidence of excessive growth

☐ Vegetation in channels does not obstruct flow

☐ Location shown on Site map Areal extent_____

Remarks Grass and some native trees and shrubs taking hold on pond covers. (Covers consist of native soil.) To protect the pond covers from vehicular traffic, vegetation on the pond covers is maintained within the perimeters of the ponds in order to keep them easily visible. *(See Photo Nos. 7 and 8)*

VIII. WETLANDS BANK MANAGEMENT X Applicable □ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on Site map ☒ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** ☐ Location shown on Site map ☒ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** ☐ Location shown on Site map ☒ Erosion not evident
Areal extent_____ Depth_____
Remarks_____
(See Photo Nos. 7 and 8)

4. **Holes** ☐ Location shown on Site map ☒ Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☐ No signs of stress

☐ Trees/Shrubs (indicate size and locations on a diagram)

Remarks Wetlands vegetation is well established. Native grasses and flowers established on slopes; tamarisk and salt cedar must be managed regularly. *(See Photo Nos. 9-11)*

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
Remarks_____

7. **Bulges** ☐ Location shown on Site map ☒ Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident

☐ Wet areas	☐ Location shown on Site map	Areal extent_____
☐ Ponding	☐ Location shown on Site map	Areal extent_____
☐ Seeps	☐ Location shown on Site map	Areal extent_____
☐ Soft subgrade	☐ Location shown on Site map	Areal extent_____

Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on Site map ☒ No evidence of slope instability
Areal extent_____
Remarks_____
_____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on Site map ☒ N/A or okay
Remarks_____
_____

2. **Bench Breached** ☐ Location shown on Site map ☒ N/A or okay
Remarks_____
_____

3. **Bench Overtopped** ☐ Location shown on Site map ☒ N/A or okay
Remarks_____
_____

C. Letdown Channels ☐ Applicable ☒ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on Site map ☒ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____
_____

2. **Material Degradation** ☐ Location shown on Site map ☒ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on Site map ☒ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____*(See Photo No. 10)*_____
_____

4. **Undercutting** ☐ Location shown on Site map ☒ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____
_____

5. **Obstructions** Type_____ ☒ No obstructions
☐ Location shown on Site map Areal extent_____ Size_____
Remarks_____
_____

6. **Excessive Vegetative Growth** Type_____

☒ No evidence of excessive growth

☐ Vegetation in channels does not obstruct flow

☐ Location shown on Site map Areal extent_____

Remarks Tamarisk and salt cedar must be managed regularly. (*See Photo No. 11)*

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs Maintenance

Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**

☐ Good condition ☐ Needs Maintenance

Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs Maintenance ☒ N/A

Remarks_____

F. Cover Drainage Layer ☒ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☒ Functioning ☐ N/A

Remarks Rip-rap covered with moss is in a small pool at the outlet before it enters the San Pedro River. Weirs at Wetlands are maintained by removing plant growth on a weekly basis. Vegetation was observed in the weirs obstructing water flow between ponds *(See Photo No. 12)*

2. **Outlet Rock Inspected** ☐ Functioning ☒ N/A

Remarks_____

□. Detention/Sedimentation Ponds ☐ Applicable ☒N/A

1. **Siltation** Areal extent_____ Depth_____ ☒ N/A

☐ Siltation not evident

Remarks_____

2. **Erosion** Areal extent_____ Depth_____

X Erosion not evident

Remarks_____

3. **Outlet Works** ☒ Functioning ☐ N/A

Remarks Improvements are being made to the stormwater drainage system at the Site. Water distribution system at the Site, including piping, is being replaced to prevent any possible leakage from system resulting in potential recharge of the perched zone.

4. **Dam** ☐ Functioning ☒ N/A
Remarks_____
_____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on Site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____
_____

2. **Degradation** ☐ Location shown on Site map ☐ Degradation not evident
Remarks_____
_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on Site map ☐ Siltation not evident
Areal extent_____ Depth_____
Remarks _See Section VII and VIII for drainage, erosion, and offsite discharge._____
_____

2. **Vegetative Growth** ☐ Location shown on Site map ☒ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on Site map ☒ Erosion not evident
Areal extent_____ Depth_____
Remarks_____
_____

4. **Discharge Structure** ☐ Functioning ☒ N/A
Remarks_____
_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on Site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____
_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____
_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. NARS Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**

☒ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A

Remarks All wells and pumps in operation at the NARS are functioning properly and well maintained.

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**

☒ Good condition ☐ Needs Maintenance

Remarks All equipment is inspected weekly by Apache Powder.

3. **Spare Parts and Equipment**

☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks Warehouse on Site where spare parts are kept.

B. Perched Zone (Southern Area) Collection Structures, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Collection Structures, Pumps, and Electrical**

☒ Good condition ☐ Needs Maintenance

Remarks The current collection system is not adequate for maximizing the extraction and evaporation of perched groundwater. The system is limited by an insufficient quantity and type of containment vessels (shallow pan-type vessels versus deep-pool type vessels). Consideration should be given to expanding and optimizing the system. *(See Photo Nos. 13-16)*

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**

☐ Good condition ☐ Needs Maintenance

Remarks

3. **Spare Parts and Equipment**

☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks

C. Constructed Wetlands Treatment System (Northern Area) ☒ Applicable ☐N/A

1. **Treatment Train** (Check components that apply)

☐ Metals removal ☐ Oil/water separation ☒ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters

☐ Additive (*e.g.*, chelation agent, flocculent) Molasses (carbon amendment) *(See Photo Nos. 17and 18)*

☐ Others

☒ Good condition ☐ Needs Maintenance

☒ Sampling ports properly marked and functional

☒ Sampling/maintenance log displayed and up to date

☒ Equipment properly identified

☒ Quantity of groundwater treated annually > 71 Million gallons in 2011 (NARS)

☐ Quantity of surface water treated annually

Remarks Sampling data is included in weekly reports.

2. **Electrical Enclosures and Panels** (properly rated and functional)
☒ N/A ☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks Molasses storage tanks are kept at the Wetlands *(See photo Nos. 17 and 18).* Tanks are used for collection of water from perched aquifer. *(See Photo Nos. 13 and 14)*

4a. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☒ Needs Maintenance
Remarks Weirs between ponds at Wetlands need be cleaned of vegetation. *(See Photo No. 12)*

4b. **Discharge Structure and Appurtenances**
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks Discharge point flow meter (operated by a solar panel) is in good condition. *(See Photo No. 19)*

5. **Treatment Building(s)**
☒ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒Good condition
☒ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks Wetlands ponds are sampled by hand._____

D. Monitoring Data

1. Monitoring Data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
☐ Groundwater plume is effectively contained
☒ Contaminant concentrations are declining in the Northern Area but not in the Southern Area.

D. Monitored Natural Attenuation for Southern Area

1. **Monitoring Wells** (natural attenuation remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks Additional monitoring wells may be needed in the Molinos Creek Sub-Aquifer (MCA) area of the Southern Groundwater Area to replace monitoring wells that have gone dry due to the lowered water table.

X. OTHER REMEDIES

As noted above, consideration needs to be given to other alternatives for enhancing the Southern Area MNA remedy, such as the in-situ pilot testing recently proposed by ANPI.

Also, during the Site Inspection, ANPI personnel toured an historic area of the Site known as the "Powder Line". Over 160 structures (no longer operational) have been identified on the Site. ANPI has identified these structures as a "legacy" issue. ANPI plans to remove these structures over the next 3-5 years as the facility is upgraded. In preparation for the demolition of the structures, this historic area is currently being surveyed and inventoried for potential hazardous waste, such as asbestos and lead-based paint. Buried sulfur in rails cars was also recently discovered at the Site. As these areas are investigated and characterized other wastes may be discovered requiring cleanup under CERCLA. *(See Photo Nos. 20 and 21).*

Green remediation has been implemented at the Apache Powder main buildings with the use of Xeriscaping, Water Harvesting, and a Solar Canopies. *(See Photo Nos. 22-24)*

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The two existing evaporative collection tanks *(see Photo Nos. 13 and 14)* replaced two more shallow collection pans previously utilized. However, in order to accelerate dewatering of the perched water, it appears that the system could be optimized. One potential method for optimization might be achieved by going back to using the more shallow collection pans, adding additional pans or collection tanks, or installing larger collection tanks or pans to take advantage of more surface area.

In the future, it may be necessary to install an additional groundwater monitor wells in the Molinos Creek Sub-Aquifer area of the Southern Area and downgradient of the hot-spot in the Northern Area.

Removal actions may be needed in the future to manage any hazardous wastes that may be discovered when ANPI demolishes and removes historic buildings no longer in use as the Site. See discussion in Section X above. *(See Photo Nos. 20 and 21)*

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The Wetlands require continual maintenance in order to keep up with the native vegetative growth. Maintenance is necessary for the removal of invasive vegetation in the ponds such as Tamarask and Salt Cedar as well as for native vegetation along the slopes of the ponds to prevent erosion. *(See Photo Nos. 10-12)*

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. N/A
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Consideration has been given to conducting an in-situ treatability pilot test in the Molinos Creek Subaquifer (MCA) in the Southern Area. Consideration needs to be given to optimizing the extraction and evaporation of the remaining water in the perched groundwater system as described above in Section A.

Apache Powder Superfund Site
5-Year Inspection, June 12, 2012

Photograph No. 1

Facility Fencing

Description: The operations area of the ANPI facility is fenced with high-security fencing and locked gates, with a guard shack controlling all vehicle and pedestrian traffic.

Photograph No. 2

Facility Fencing

Description: Photo depicts type of high-security fencing around operations area (inset shows razor wire). Fencing at the Wetlands area to prevent vehicle access only.

Photograph No. 3

Signage at Former Evaporation Pond

Description: This photograph shows typical signage at the ponds. Signs were in good condition and well placed.

Photograph No. 4

Signage at Former Evaporation Pond

Description: This photograph shows typical placement of signs around the perimeter of the ponds. (Orange shows front of signs and white shows back of signs.)

Apache Powder Superfund Site
5-Year Inspection, June 12, 2012

Photograph No. 5

Former Evaporation Pond Cover

Description: This photograph represents a typical pond cover, well maintained with no erosion visible. Wattles help prevent erosion and define pond cover boundaries.

Photograph No. 6

Former Evaporation Pond Cover

Description: Wattles are in place and well maintained to protect the pond covers from erosion and vehicular traffic. When wattles begin to deteriorate a new one is placed on top and the two are staked together as shown here.

Photograph No. 7

Vegetation on Former Evaporation Pond Covers

Description: Native vegetation is taking hold on the pond covers. Typical native vegetation is shown in the photograph.

Photograph No. 8

Vegetation on Former Active Pond Covers

Description: In some areas, native vegetation is taking hold on the pond covers including native bushes and trees in some areas.

Apache Powder Superfund Site
5-Year Inspection, June 12, 2012

Photograph No. 9

The Wetlands

Description: The Wetlands appear healthy and continues to be a successful remedy for nitrate contaminated groundwater.

Photograph No. 10

Wetlands Vegetation to Erosion

Description: Successful hydro-seeding, done in 2011, provides native grasses and flowers along the slopes into the ponds (treatment cells), preventing erosion along the slopes. .

Photograph No. 11

Wetlands Salt Cedar and Tamarisk

Description: Salt cedar (see arrows) and Tamarisk (not shown), both invasive species, must be continually maintained.

Photograph No. 12

Weir Maintenance at Wetlands

Description: Weirs located between the ponds (treatment cells) at the Wetlands must be kept free of vegetation and debris regularly in order to function properly**.**

Photograph No. 13

Perched System
Collection Tanks

Description: One of two tanks used to collect water pumped from the perched aquifer is shown here.

Photograph No. 14

Perched System
Collection Tanks

Description: Interior view of a water collection tank for the perched system with the water pump operating.

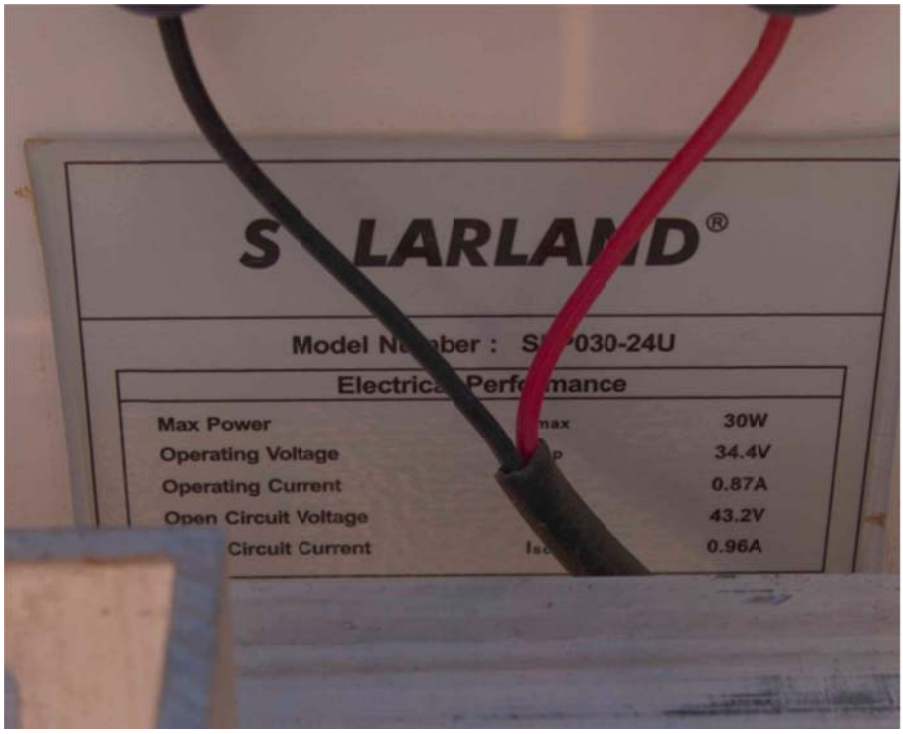
Photograph No. 15

Perched System Solar Panel

Description: Solar panel used to operate water pump. (Shallow evaporation pan shown on the left is no longer in use; however, should be reconsidered to maximize evaporation).

Photograph No. 16

Perched System Solar Panel Specifications



Description: Close-up view of the pump specifications.

Apache Powder Superfund Site
5-Year Inspection, June 12, 2012

Photograph No. 17

Wetlands Molasses Tanks

Description: Permanent 5,000-gallon molasses storage tank located at the Wetlands. Molasses from this tank is pumped into the 500-gallon trailer-mounted tank shown in photograph number 17.

Photograph No. 18

Wetlands Molasses Tanks

Description: Trailer-mounted 500-gallon molasses tank. This trailer-mounted tank transports molasses from the 5,000-gallon permanent tank in photograph 12 to be pumped into the portable 250-gallon totes, shown on the right side of the photograph.

Photograph No. 19

Wetlands Equipment
(Flow Meter)

Description: Flow Meter to measure effluent discharge from the Wetlands is powered by renewable energy from a solar cell. Monitor wells and associated pump-and-treat equipment were found to be in good shape and in working condition.

Photograph No. 20

"Powder Line"

Description:
The row of buildings shown built into the sides of the hills is known as the "Powder Line". Dynamite sticks were assembled in them for Apache Powder beginning in the early1920's. The idea was that if an explosion occurred, only the one building would be.

Photograph No. 22

Green Remediation
Xeriscape

Description: ANPI has incorporated "Green" design into their main offices. This photo shows the use of Xeriscape, appropriate for the desert climate.

Photograph No. 23

Green Remediation
Solar Power

Description: ANPI constructed a solar canopy over the front of the main administration building. The solar panels provide renewable energy and off-sets power needs for the building.

Photograph No. 24

Green Remediation
Water Harvesting

Description: ANPI utilizes gutters placed along the roofs of the main office buildings to harvest rain water. This water is used to fill the fountain located on an outside patio. Water is also used to maintain the Xeriscape.

Apache Powder Superfund Site
Third Five-Year Report

Appendix D
Technical Assessment Survey Forms

Apache 2012 Five-Year Review Technical Interview Questionnaire

Interviewee/Title: Jeff Bauer / EHS Specialist

Organization/Company/Agency: Apache Nitrogen Products, Inc.

Address/Phone/E-Mail: PO Box 700, Benson, AZ 85602/ 520.720.2177

Site Name: Apache Powder Superfund Site, Cochise County, AZ

EPA ID No.: AZD008399263

Date Interview Questionnaire Completed: 6/12/12

1. What is your current role as it relates to the site? What is your overall impression of the work conducted at the site to date? (general sentiment)

Response: Superfund operations: Impressed and proud to work with the wetlands along with all other superfund activities and reporting.

2. Have any problems been encountered which required, or will require changes to this remedial design or ROD?

Response: No.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing? Have any new or emerging COCs been identified? If so, have they impacted the effectiveness of the remedy?

Response: Overall COC's are decreasing.

4. Have there been routine communications or activities (site visits, inspections, reporting activities, etc) conducted by your office regarding the site? If so please give purpose and results.

Response: 2 meetings for 2012 with ANPI, EPA & ADEQ, emails going over the 5 year review. Technical meeting on 6/12/12 along with the 5 year review checklist.

5. Would you say that O&M and/or sampling efforts have been optimized? Please describe how improved efficiency has or has not occurred.

Response: O&M acceptable due to COC's are general decreasing. De-water the perched zone.

6. Are you aware of any institutional controls, site access controls, new ordinances in place, changes in actual or projected land use, complaints being filed or unusual activities at the site? If so, please describe in detail.

Response: No

7. Do you have any comments, suggestions, or recommendations regarding the site?

Response: ANPI has a new General Manager

Apache 2012 Five-Year Review Technical Interview Questionnaire

Interviewee/Title: Patricia A. Clymer

Organization/Company/Agency: ITSI Gilbane Company

Address/Phone/E-Mail: 1501 W. Fountainhead Parkway, Tempe AZ 85282
520-977-7794 / pclymer@itsi.com

Site Name: Apache Powder Superfund Site, Cochise County, AZ

EPA ID No.: AZD008399263

Date Interview Questionnaire Completed: August 1, 2012

1. What is your current role as it relates to the site? What is your overall impression of the work conducted at the site to date? (general sentiment)

Response: I am the Project Manager for ITSI Gilbane, supporting EPA at the Site. I believe that ANPI has done an excellent job with the site. They have shown creativity in their work with their implementation of the remedies and are dedicated to continuing to improve.

2. Have any problems been encountered which required, or will require changes to this remedial design or ROD?

Response:

- The Perched Zone collection system is not adequate for maximizing the extraction and evaporation of the perched groundwater. The system is limited by an insufficient quantity and type (shallow pan-type vessels versus deep-pool type vessels). Consideration should be given to expanding and optimizing the system.
- Consideration has been given to accelerating the cleanup time for the Molinos Creek Subaquifer (MCA) in the Southern Area.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing? Have any new or emerging COCs been identified? If so, have they impacted the effectiveness of the remedy?

Response:
Southern Area Groudwater

- In the perched zone, both perchlorate and nitrate concentrations have increased over the last several years. The explanation for these increasing concentrations has been explained as a stratification process in which high concentrations of nitrate and perchlorate collect at the bottom of the perched aquifer as it is dewatered and cleaner

recharge water collects nearer the surface of the aquifer. A new remedial action objective for this area may be needed.

- In the Molinos Creek Sub-Aquifer (MCA) the concentrations of nitrate and perchlorate have not decreased as should be the case with MNA. Instead, concentrations have remained stable in some monitor wells and actually increased in others. The water level is also declining in this area. Though there may be an explanation for the increase in contaminant concentrations, other alternatives should be considered to enhance the MNA remedy.
- Monitoring results of the Shallow Aquifer near San Pedro River has remained either non-detect or at levels below the MCL for perchlorate and nitrate.

Northern Area Remediation System (NARS)

- Monitoring results for the groundwater remedy (wetlands/pump and treat) indicates that the system is very effective and performing well.

4. Have there been routine communications or activities (site visits, inspections, reporting activities, etc) conducted by your office regarding the site? If so please give purpose and results.

Response: In support of EPA, I have attended annual technical meetings, reviewed site documents, and monitoring data, and have been responsible for conducting annual site inspections for the former ponds and the wetlands. No problems were identified during the inspections with the exception of minor maintenance regarding vegetative growth at the wetlands and some occasional erosion around the former ponds. All of the issues were dealt with in a timely fashion.

5. Would you say that O&M and/or sampling efforts have been optimized? Please describe how improved efficiency has or has not occurred.

Response: I believe that O&M and sampling has been efficient.

6. Are you aware of any institutional controls, site access controls, and new ordinances in place, changes in actual or projected land use, complaints being filed or unusual activities at the site? If so, please describe in detail.

Response: No.

7. Do you have any comments, suggestions, or recommendations regarding the site?

Response:

- The SEW-1 monitoring well network might benefit from the installation of an additional well placed south-east of SEW-1 and west of the San Pedro River that would ensure the contamination from the "hot-spot" area upgradient of the SEW-1 is being captured by SEW-1 and not discharging to the San Pedro River.

Apache 2012 Five-Year Review Technical Interview Questionnaire

Interviewee/Title: Mellissa Himebauch EHS Intern

Organization/Company/Agency: Apache Nitrogen Products, Inc.

Address/Phone/E-Mail:
520-975-9438 mhimebauch@apachenitro.com

Site Name: Apache Powder Superfund Site, Cochise County, AZ

EPA ID No.: AZD008399263

Date Interview Questionnaire Completed: 06/14/2012

1. What is your current role as it relates to the site? What is your overall impression of the work conducted at the site to date? (general sentiment)

Response: My current role is as an Environmental Intern. I feel that the company is trying very hard to be environmentally responsible. They have been making huge efforts with the help of new management to clean up and manage areas that have been of concern.

2. Have any problems been encountered which required, or will require changes to this remedial design or ROD?

Response: As I am an intern that has only been with the company for 3 weeks I am unsure at this point that any changes need to be made.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing? Have any new or emerging COCs been identified? If so, have they impacted the effectiveness of the remedy?

Response: The only area that I have had any experience with is the Wetlands area. Looking at the history of the reports I can see a downward trend in the level of Nitrates coming into the wetlands from just 2 years ago. I can also see that the wetlands are functioning very well and the levels drop dramatically after the first couple ponds. I am not aware of any new or emerging COC's.

4. Have there been routine communications or activities (site visits, inspections, reporting activities, etc) conducted by your office regarding the site? If so please give purpose and results.

Response: As a department we visit the site on an almost daily basis to ensure that everything is functioning well. We monitor and document the Nitrate levels, water levels, and temperatures in house as well as have Hargis & Associates assist with that as required. Weekly reports on the Nitrate levels from the wetlands are sent to Hargis for their review.

5. Would you say that O&M and/or sampling efforts have been optimized? Please describe how improved efficiency has or has not occurred.

Response: I feel that the efforts Apache makes to monitor and sample the wetlands area is optimized.

6. Are you aware of any institutional controls, site access controls, new ordinances in place, changes in actual or projected land use, complaints being filed or unusual activities at the site? If so, please describe in detail.

Response: As a new Intern I am not aware of any at this point.

7. Do you have any comments, suggestions, or recommendations regarding the site?

Response: I think that this is a really great site and with the new proactive management the company will be able to move in a positive direction in regards to any environmental concerns.

Apache 2012 Five-Year Review Technical Interview Questionnaire

Interviewee/Title: Leo S. Leonhart, PhD, RG, Principal Hydrogeologist, Project Director

Organization/Company/Agency: Hargis + Associates, Inc.

Address/Phone/E-Mail: 1820 E. River Road, Suite 220, Tucson, Arizona 85718
520-881-7300 x201
lleonhart@hargis.com

Site Name: Apache Powder Superfund Site, Cochise County, AZ

EPA ID No.: AZD008399263

Date Interview Questionnaire Completed: June 9, 2012

1. What is your current role as it relates to the site? What is your overall impression of the work conducted at the site to date? (general sentiment)

Response: I am the project director for Hargis + Associates, Inc., the primary environmental contractor for ANPI over the past 23 years. My overall impression of the work to date is that it represents an impressive achievement over a formidable environmental challenge that developed at the site over its early years of operation. I am proud to have assisted in this project.

2. Have any problems been encountered which required, or will require changes to this remedial design or ROD?

Response: The rate of progress towards the remedial goals in the Southern Area (MCA) groundwater cleanup indicates a very long timeframe. Remedy enhancements are presently under consideration.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing? Have any new or emerging COCs been identified? If so, have they impacted the effectiveness of the remedy?

Response: As indicated above, the progress toward achieve the goal of dewatering the MCA is slow and projected timeframe is long. Monitoring data at monitor well MW-21 indicate increasing concentration trends, however, this does not indicate increasing mass into the closed basin, but rather a limitation in the ability to quantify the vertical distribution of COCs. At the same time, it is noted that, while the nitrate-N, is increasing, at this well, the perchlorate trend has somewhat stabilized.

4. Have there been routine communications or activities (site visits, inspections, reporting activities, etc) conducted by your office regarding the site? If so please give purpose and results.

Response: H+A, as ANPI's environmental contractor, conducts quarterly groundwater monitoring and NARS monitoring at the site. Additionally, H+A performs an annual inspection of the pond covers. There are occasional meetings and frequent phone conversations with ANPI environmental staff. NARS operational data are reviewed weekly and, if necessary, discussed with the staff (e.g., trends, spikes, maintenance, upsets, etc.). Significant information resulting from these activities is summarized in the Annual Report, as well as monthlies and quarterlies submitted to EPA & ADEQ.

5. Would you say that O&M and/or sampling efforts have been optimized? Please describe how improved efficiency has or has not occurred.

Response: I believe the O&M activities are constantly under review and optimization is under consideration. For example, issues with NARS operations are often raised by ANPI personnel. Review of weekly reports are reviewed by H+A & Dr. Gearheart, noting any particular problems or opportunities for improvement. H+A's quarterly monitoring provides oversight of ANPI's personnel, etc. If any component of the project is presently not optimized, it soon will be.

6. Are you aware of any institutional controls, site access controls, new ordinances in place, changes in actual or projected land use, complaints being filed or unusual activities at the site? If so, please describe in detail.

Response: I am not aware of any such issues.

7. Do you have any comments, suggestions, or recommendations regarding the site?

Response: ANPI is actively engaged in a multi-year program of site improvement and modernization. This work will improve both the operations and property. The Agency should consider these plans as they move forward as an opportunity to enhance environmental quality in various innovative ways.

Apache 2012 Five-Year Review Technical Interview Questionnaire

Interviewee/Title: Eric Roudebush, PE, Project Manager

Organization/Company/Agency: Hargis + Associates, Inc.

Address/Phone/E-Mail: 1820 E. River Road, Suite 220, Tucson, AZ 85718
520-881-7300 Ext 204
eroudebush@hargis.com

Site Name: Apache Powder Superfund Site, Cochise County, AZ

EPA ID No.: AZD008399263

Date Interview Questionnaire Completed: July, 31, 2012

1. What is your current role as it relates to the site? What is your overall impression of the work conducted at the site to date? (general sentiment)

Response: I am the Apache Nitrogen Products, Inc. (ANPI) project manager for Hargis + Associates, Inc. (H+A). My impression of the work conducted at the site to date is that the work has been very effective in investigating, monitoring, and remediating the site COCs.

2. Have any problems been encountered which required, or will require changes to this remedial design or ROD?

Response: No, although remedy enhancements are being evaluated.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing? Have any new or emerging COCs been identified? If so, have they impacted the effectiveness of the remedy?

Response: In general, the Northern Area groundwater quality trends show decreasing concentrations. In the Southern Area MCA, the groundwater level data show a decreasing trend and the water quality data show an increasing trend. No new or emerging COCs have been identified.

4. Have there been routine communications or activities (site visits, inspections, reporting activities, etc) conducted by your office regarding the site? If so please give purpose and results.

Response: H+A conducts quarterly groundwater and NARS monitoring. H+A also conducts annual inspections of the pond covers. The monitoring results are presented to EPA and ADEQ in monthly, quarterly, and annual reports.

5. Would you say that O&M and/or sampling efforts have been optimized? Please describe how improved efficiency has or has not occurred.

Response: I believe the O&M and sampling efforts have been optimized. However, additional optimization efforts will be considered as necessary.

6. Are you aware of any institutional controls, site access controls, new ordinances in place, changes in actual or projected land use, complaints being filed or unusual activities at the site? If so, please describe in detail.

Response: I am not aware of any such issues.

7. Do you have any comments, suggestions, or recommendations regarding the site?

Response: A great deal of progress has occurred since ANPI was listed as a Superfund site. The ANPI management is very proactive in the site remediation process.

Apache 2012 Five-Year Review Technical Interview Questionnaire

Interviewee/Title: Robert Walllin, Hydrologist/Project Manager

Organization/Company/Agency: Arizona Department of Environmental Quality

Address/Phone/E-Mail: 400 W. Congress St., Ste 433, Tucson, AZ 85701
(520) 628-6743, wallin.robert@azdeq.gov

Site Name: Apache Powder Superfund Site, Cochise County, AZ

EPA ID No.: AZD008399263

Date Interview Questionnaire Completed: 6/12/12

1. What is your current role as it relates to the site? What is your overall impression of the work conducted at the site to date? (general sentiment)

Role: Arizona Department of Environmental Quality Project Manager

Response: The remedies currently in place are working. Levels of groundwater contamination are gradually decreasing. Continued monitoring will be required for many years. Enhanced remedies proposed by ANPI would help accelerate the process, and would be acceptable to ADEQ.

2. Have any problems been encountered which required, or will require changes to this remedial design or ROD?

Response: Current remedies are working. Enhanced remedies would accelerate the process.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing? Have any new or emerging COCs been identified? If so, have they impacted the effectiveness of the remedy?

Response: Contaminant levels are decreasing except in one area where the concentration of contaminants due to dewatering. However, these increases can be explained. An enhanced remedy proposed for this area will help to remove contamination.

4. Have there been routine communications or activities (site visits, inspections, reporting activities, etc) conducted by your office regarding the site? If so please give purpose and results.

Response: There have been routine communications between ADEQ, EPA, ANPI and contractors regarding reporting and commentary on monitoring reports. ANPI is effectively maintaining its remedy operations. Site visits have not been necessary.

5. Would you say that O&M and/or sampling efforts have been optimized? Please describe how improved efficiency has or has not occurred.

Response: The Annual Monitoring Reports demonstrate that O&M of remedies is effective and sampling has been optimized. Recommendations made in Annual Monitoring Reports for improved monitoring strategies have been implemented to improve efficiency.

6. Are you aware of any institutional controls, site access controls, new ordinances in place, changes in actual or projected land use, complaints being filed or unusual activities at the site? If so, please describe in detail.

Response: There have been no new institutional controls, ordinances, land uses or complaints. ANPI has put up new fencing to enhance security at the site.

7. Do you have any comments, suggestions, or recommendations regarding the site?

Response: ADEQ will review and comment on proposals for enhanced remedy pilot tests.